ONE DOLLAR PER COPY

the OIL AND GAS JOURNAL

OCTOBER 20, 1958

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EXPLORATION NEWS p. 141

Where Are Crude Prices Today?

Price cuts have hit 45% of nation's production in past year. Cost to producers: $700,000 per day. p. 47

Crash Program to Put Hess Refinery on Stream Next Month

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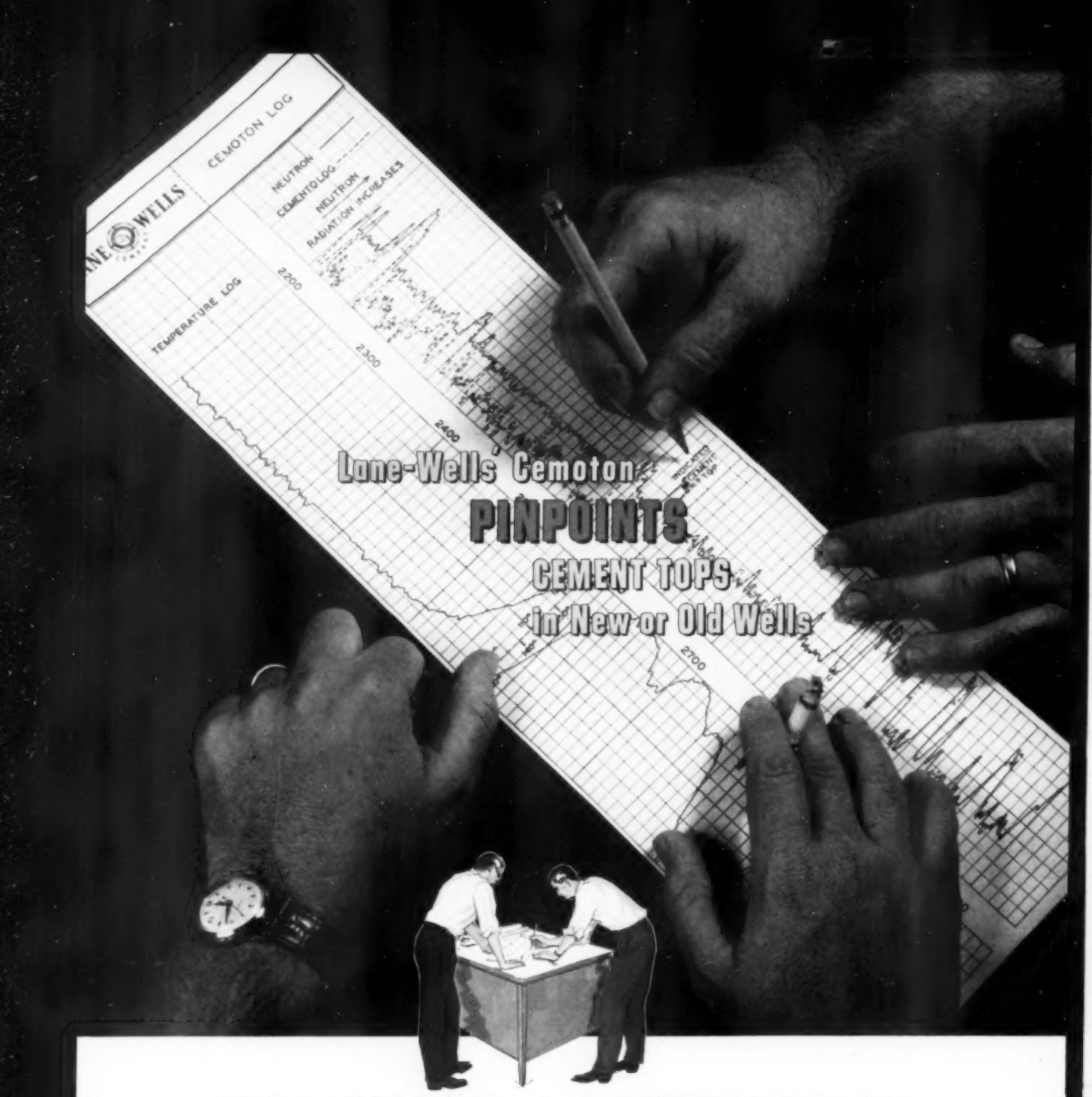
How to Cut Corrosion In Water-Flood Systems

p. 74

Russia Has Big Plans for Natural Gas p. 72



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The OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
Oct. 20, 1958

Crude-price cuts are costing producers heavily:

Revenue loss in last 12 months tops $700,000 daily.
Loss in last 6 months alone is $463,000 daily.
New price study by The Oil and Gas Journal shows 45% of U. S. production has suffered price cut since last October, wiping out much of gains made by the 1957 price increase.

Cuts since April average 20.51 cents a barrel and have affected 2,260,470 bbl. daily of production.
Biggest sufferers have been producers in California, Louisiana, Texas, and Oklahoma.
Chief reasons for the cutting: Oversupply of crude and weak refined-products prices (p. 47).

▼ ▼ ▼

Active rotary rigs picked up last week.
Rigs operating now total 1,972, highest since February 10, and a happy note for drilling contractors.
Rigs in service have averaged 1,909 for the last 6 weeks. Low activity rate of recent months came in late July when only 1,748 were active. Highest in recent months was 1,936 reported at work on September 15.

Another sign of an upturn in drilling, production:
Lone Star Steel has fired up two of its open-hearth furnaces and will start producing pipe after its August 3 shutdown.
Depleted pipe inventories in several sizes make the move necessary. Lone Star sees a buying pickup ahead because of signs of a fourth quarter spurt in drilling and depleted consumer pipe stocks.

News on the superdeep wildcats:
...Phillips' 1-EE University, world's deepest well in Pecos County, Texas, is at 25,182 ft. Drilling started up again late in the week after logs were run.
...Phillips' 1-A Montgomery, only 13 miles southwest of the 1-EE University, also was shut down last week. Crew has completed a fishing job at 11,000 ft. Tests of perfora-

tions in the Ellenburger at 22,600-880 ft. were scheduled over the weekend.

...Shell's 5 Rumberger in Oklahoma's Elk City field, is nearing 24,000 ft. Operator plans to close down drilling to await decision on testing earlier shows.

Oil men will be talking about the offshore blowout near High Island for a long time.

It's the worst blowout in history of the industry because it involved the greatest number of wells. For a time all wells tied to the platform went wild when their heads were damaged by the explosion.

The tragedy points up the added risks offshore oil men have to take by completing numerous wells from a single platform.

▼ ▼ ▼

The 50-50 profit split with foreign governments in oil development programs may suffer another jolt.

Indiana Standard is rumored considering a deal that will give Saudi Arabia 60% of the profits from production and also a share in refining and marketing profits.

Concession area under consideration lies in the middle of the Arabian peninsula. It's in the region set aside as a preferential area for Aramco, only company presently operating in Saudi Arabia.

Future of oil developments in North Africa hinge on what France, under DeGaulle, can work out in Algeria.

AAPG President Geo. Buchanan says Tunisia's Bourguiba wants a loose alliance of Libya, Tunisia, Algeria, and Morrocco. All have a common heritage and common problems.

If this North African alliance could work out friendly political and economic deals with Western Europe and U. S., it would be a good balance against Egypt and Nasser's United Arab League.

Buchanan advocates U. S. backing for a free Algeria and free Israel, and full support for Turkey.

Prospects of Libya's first oil field appear better on basis of Oasis Oil's second wildcat (p. 66).

Oasis' B-1-32 Dahra yielded 38 bbl. of 36°-gravity oil in 75-minute drill-stem test between 3,758-808 ft. Well was drilling ahead below 4,750 ft. at end of week.

Dahra well is 24 miles south of Oasis' 1 Bahi discovery. Wildcats are on 1,225,000-acre block about 75 miles south of Mediterranean Gulf of Sirte.

Oasis is owned by Ohio, Amerada, and Continental.

Venezuela favors a unified Western Hemisphere oil policy.

The official line of the new Venezuelan Government was given SEG delegates by Dr. Eduardo A. Acosta, oil attache to the Venezuelan embassy. He pointed out he spoke for the oil officialdom in Caracas (p. 60).

Acosta's reasoning: Venezuelan and Canadian oil is really domestic oil and should be given preferential treatment in any U. S. imports-control program.

Acosta stressed the valuable defense position of Venezuelan oil and declared his country is striving to meet its obligations to establish greater reserves for this hemisphere.

Other foreign reports:

Offshore drilling in Mexico's Gulf of Campeche so far has failed to turn up oil. The Pauley venture has four dry holes, but has spudded a fifth well...Second test in Turkey will be spudded soon by Bolsa Chica on 37,000-acre concession. First was abandoned at 6,449 ft. as dry.

Big Chief Drilling Co., Oklahoma City, also has a deal cooking to send two or three heavy rigs to southeastern Bolivia.

First rig is being assembled in Houston now.

▼ ▼ ▼

Vast gas reserves of Alberta's Pincher Creek are now officially tied into Trans Canada pipeline.

Valve turning first flow from the 2-trillion cubic feet reserve into the pipeline was turned by Premier Manning at ceremonies opening British American's $25-million field processing plant.

BA officials see great future for Pincher Creek and Alberta gas. If export markets are made fully available, they predict 100-trillion cubic feet of gas can be discovered in Western Canada in next 25 years (p. 54).

FPC holds key to how long Aneth area production will be shut down in Utah.

El Paso Natural is building a pipeline to connect Aneth reserves to its San Juan system. Although processing facilities in Aneth haven't been started, El Paso Natural could move the gas to its San Juan River plant until Aneth plant is built.

Holdup on this temporary action is protest on prices paid in field. Case has been on file before FPC since last December. Prospect of long delays in handling waste gas prompted the unusual shutdown order to protect Indian resources (p. 49).

▼ ▼ ▼

Quick supply of avgas on short notice is a critical problem for U. S. military forces even in a minor operation.

That's the big lesson learned from the Lebanon venture, delegates to the Quartermaster Association convention heard. The sudden surge of avgas demand was more than the industry could immediately supply.

The avgas problem is sufficiently serious that it may be referred to the National Petroleum Council for study.

Key to the problem may be the military's inventory policy. Some refiners at the start of the Lebanon operation said they feared the military had let its stocks dwindle too low as an economy move.

With inventories low, refiners weren't able to supply the huge volumes of avgas immediately. The military, however, didn't suffer, and refiners finally caught up (p. 57).

Amazing speed in building a refinery is being shown by engineers and workmen on the New Jersey plant for Hess Transport & Trading.

Some crude units may start up before the month is out. Downstream units will follow early in November. All this has been built since April, on a 100-acre, waterfront location on Arthur Kill near most of metropolitan New York's marine terminals.

The new plant will qualify Hess as an importer under the new program. Company has been importing under the voluntary plan and storing the foreign crude awaiting opening of the refinery (p. 50).

Labor notes: Strikers at Indiana Standard's Mandan, N.D., refinery have returned to their jobs. The month-old strike was settled when union agreed to same terms in old contract. No wage increase was granted but wage reopening is possible after a year...Coordinated drive for 7.5% wage increase is being planned against Indiana Standard by two independent unions, Central States Petroleum Union and Independent Petroleum Workers of America. Each group agrees to support other's position in case of strike.

▼ ▼ ▼

Gulf confirms that the operating headquarters for its domestic production will be moved from Pittsburgh to Houston around the first of the year (OGJ, Newsletter, Oct. 13).

Gulf's announcement stressed two points:

...No large number of employes is affected.

...Division headquarters in Fort Worth and Houston will be continued "under present plans."

A Gulf official, however, had said earlier that division offices in Tulsa are being closed and a similar move is planned ultimately in Fort Worth and Houston.

The decentralization move has been under way for some time. It gives more authority to district offices with a closer liaison with company headquarters.

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33-MILE HITCH IN A DITCH

R. B. Hodgson & Company of Dallas used the Oliver OC-4 with narrow 31-inch tread to level the bottom of this 33-mile ditch at Midland, Texas. It reduced manpower requirements from a 7-man crew to one operator and two cleanup men.

Equipped with a 44-inch dozer blade, the OC-4 works in a ditch 48 inches wide and 8 feet deep to clean and level before laying the pipe. Where rock is encountered, the OC-4 spreads sand on the bottom to form a cushion for the pipe. The tractor comes out only for periodic maintenance and lubrication since there is no room on either side for servicing.

Here's another way the versatile OC-4 can cut costs on pipeline jobs. New 4-speed transmission provides a change of pace ranging from 1½ to 5¼ m.p.h. to meet every need for speed and power. It's available with a complete line of attachments for scores of assignments around rigs and refineries, too. Ask your Oliver distributor for all the facts. Or write us for literature.

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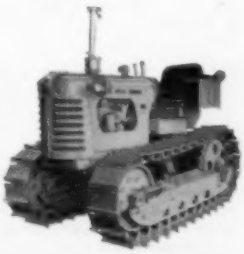

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TECHNOLOGY—OPERATION

Drilling-Production

Less Oxygen—Less Corrosion in Brine Floods 74

By L. C. Case and W. C. Whiteside

Laboratory data, confirmed by field operation, show that oxygen in brines has appreciable effect on corrosion of steel, down to a concentration of 0.3 p.p.m. And a rate of 5 mils per year or greater should be expected when brines contain as much as 1 p.p.m. oxygen.

Rig Has Mufflers Under Derrick Floor 76

Mechanical vs. Electric Drive for Drilling Rigs 90

By W. P. Stephens and A. H. Candee

Direct drive from the engines of a drilling rig to the draw works and to the slush pumps is practical and the system has inherent advantages. Electric drive has some advantages, too, now that high-power, lightweight equipment is available. Here is a comparison of the two.

Portable Gage Provides New Way to Read Pressures 98

Pipelining

Combustion-Air Conditioning for Pipeline Engines 84

By W. R. Crooks

This is not a passing fad but a necessity for engines when higher specific output and low fuel consumption are desired. This article evaluates the place of this technique with natural-gas-fuel internal-combustion engines.

Uprate Flanges With an O-Ring Seal 111

By J. W. Squire

With ASA 300 flanges in sizes up to 12 in., working pressure may reach 1,440 psi. safely when using O-ring seals. In smaller sizes, an ASA 600 rating may be achieved using the 300 flanges.

Refining-Processing

Electronic-Controlled Cat Cracker Operates Successfully 77

By C. D. Gingrich

An all-electronic-controlled cat cracker has been operated successfully at the Port Credit, Ont., refinery of Regent Refining, Ltd. Results show that electronic instrumentation is superior to the pneumatic type.

Better Materials of Construction for Petrochemical Processing 82

By E. H. Edwards

Austenitic stainless steels, high-nickel alloys, tantalum, molybdenum, and zirconium are some of the construction materials which are showing promise in corrosive environments.

Eastern States Boosts Platformer Capacity 96

By Larry Resen

A capacity of increase of more than 50% has been made as a result of a recent expansion of Eastern States Petroleum & Chemical Corp.'s UOP Platforming unit, Houston refinery.

Eunice Extraction Plant Processes Lean Gas 100

By Larry Resen

The new $6,000,000 plant removes 5,000 bbl. of liquids daily from 300 M.M.c.f. of pipeline gas per day. Low-temperature processing (—40 °F.) is required. Thus, special dehydration operations are required.

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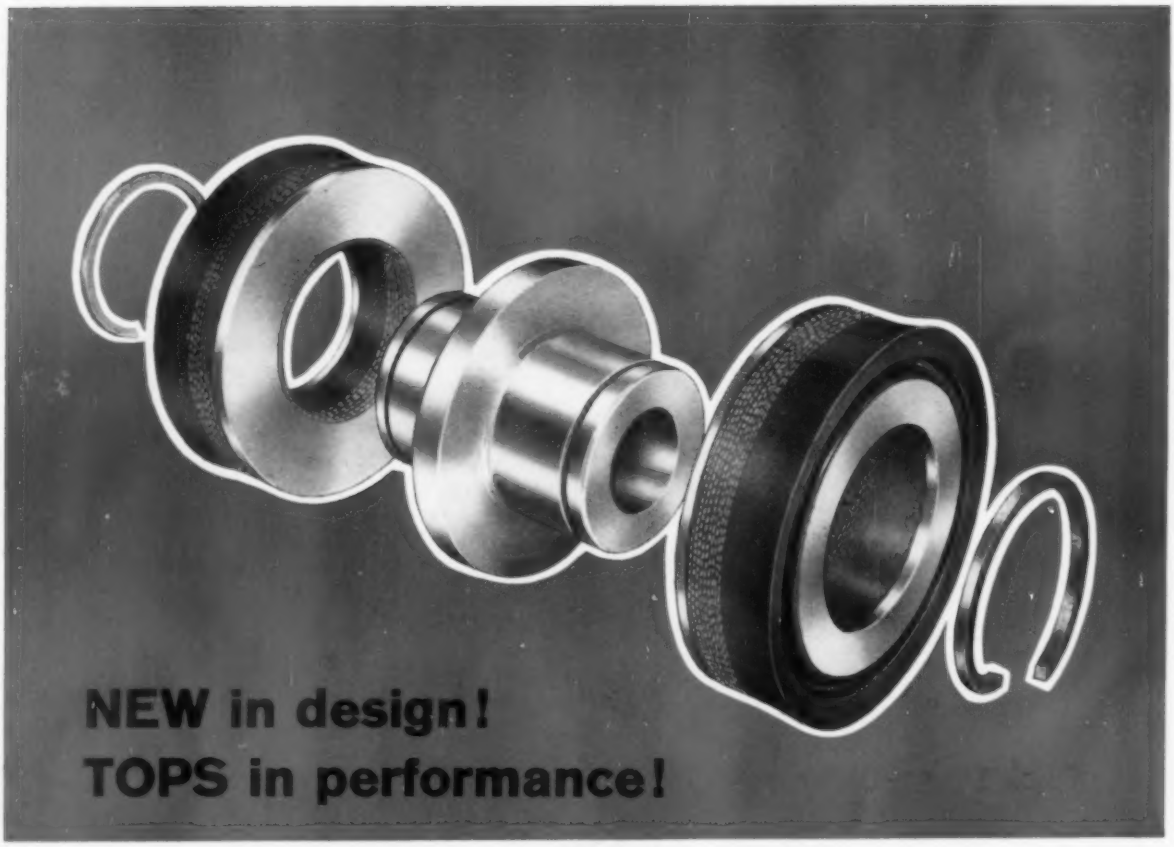

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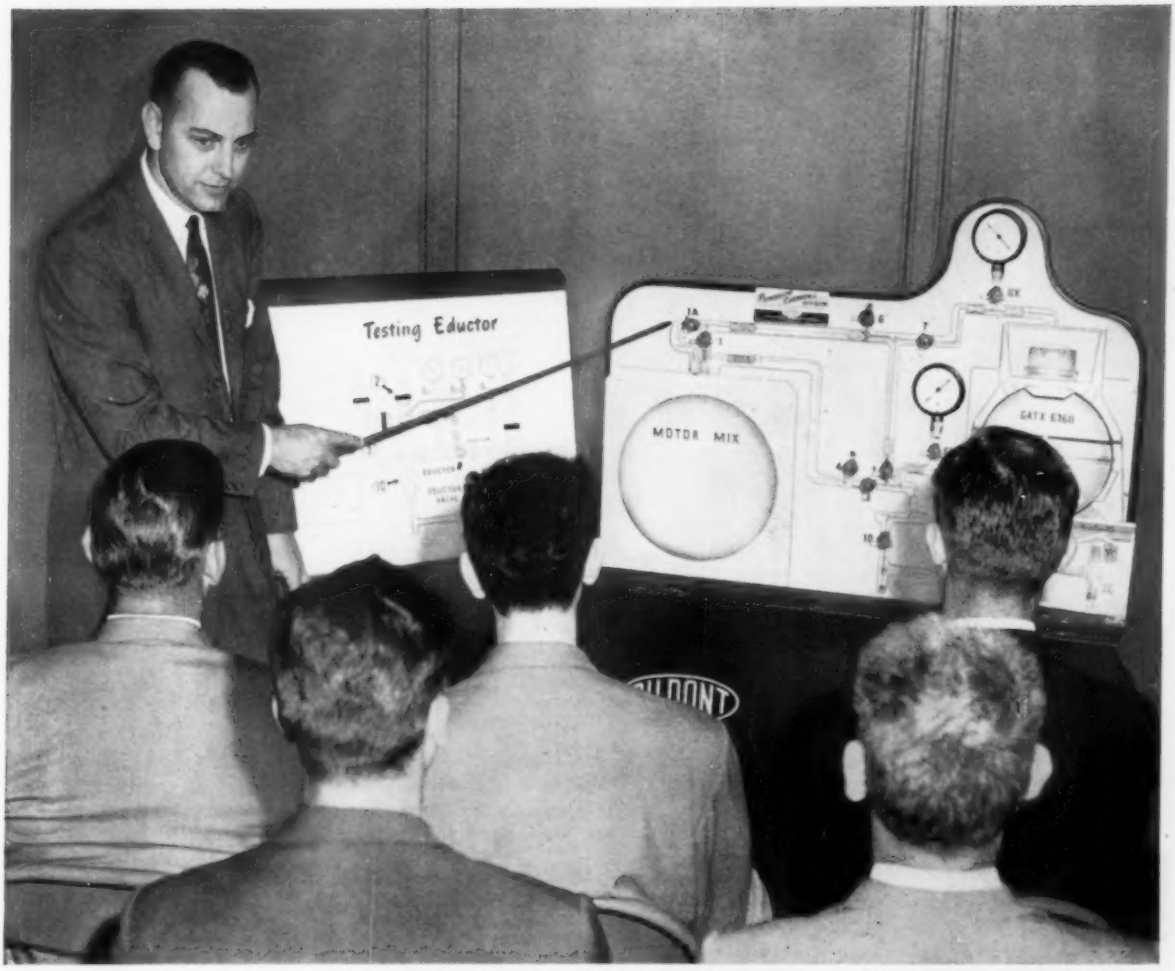

TYPICAL TRAINING SESSION conducted by Ron W. Beecher, Du Pont's Central Region Operations Coordinator, using scale-model blending plant to show safety procedures in unloading and weighing TEL from tank car.

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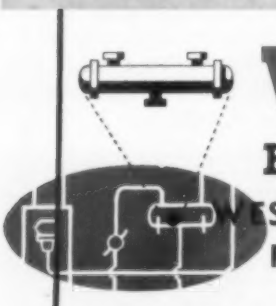

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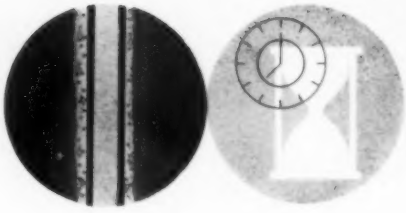

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HALLIBURTON *"DV" Multiple Stage Cementer*

The Industry's ONLY Two and Three Stage Cementing Tool!

The "DV" (Differential Valve) Multiple Stage Cementer, using the successful principle of hydraulics, is of vital importance to all multiple cementing jobs.

This cementing "workhorse" consists primarily of a steel external case and two internal sleeves constructed and arranged so the cementing ports through wall of the tool can be opened for one stage of cement and then locked closed, by the use of plugs pumped down with the cement slurry and displacing fluid.

Especially designed plug sets are available in BOMB TYPE where (1) Cement *is not* required on bottom stage to fill annulus to point where "DV" Cementer is stationed and (2) Where distance between tool and casing is relatively large . . . and DISPLACEMENT TYPE, used where the opposite requirements exist.

This dependable precision tool has performed successfully on many thousands of wells regardless of depth, pressure or temperature. Two "DV" Multiple Stage Cementers are used for three stage cementing. For your next well, take advantage of all the savings made possible by the "DV" Cementer.

"The latest developments in oil well cementing— come from Halliburton."

Pozmix Cements

These superior performance cements combat cementing problems more successfully than conventional portland cement, with greater economy and more durability. Its outstanding performance record in thousands of cementing jobs, in vast varieties of applications, is unsurpassed. Its desirable qualities provide resistance to sulfate and salt water corrosion, is easier to pump and easier to perforate; is less permeable; and longer lasting at a lower cost.

POZMIX 140 provides long pumpability and strength stability in deep hot wells. Unlike many cementing compositions, Pozmix 140 does not lose strength with curing at elevated temperature.

HALLIBURTON *Gel-Cement*

A weight reducing additive which utilizes additional mixing water to provide a reduction in slurry weight, increased slurry volumes and reduced cementing costs. Howcogel used in cement is the same high yield Wyoming type bentonite employed in drilling mud to provide low fluid loss and excellent suspension qualities for the removal of cuttings and the supporting of weighting materials.

HALLIBURTON *Super Seal Floating Equipment*

Super Seal Float Valves with Rubber Seal Rings in Halliburton Float Shoes and Float Collars . . . resist wear for a more positive shut-off . . . have more than twice the sealing area of ordinary ball and seat valves. Valve assembly is unaffected by well fluids, high down-hole pressures and temperatures up to 400°F.

Special concrete formula in guide nose provides greater shock resistance . . . improved design gives "better than average" guiding action.

HALLIBURTON *Self-Fill Differential Collar*

Simple construction, engineered for maximum speed, provides higher efficiency in automatic casing filling of well fluids, even in the deepest wells.

The Halliburton Self-Fill Differential Collar, when placed above the Super Seal Valve, reduces running-in time. Provides greater protection for weak formations . . . helps eliminate low pressure areas below . . . operates effectively in drilling mud containing high percentages of lost circulation materials and cuttings. Circulation may be established, when desired, without tripping the Self-Fill Collar. Designed for use with Super Seal Floating Equipment.

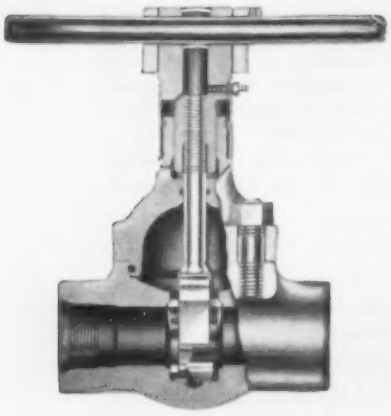
Gilsonite Cement

Lightens slurry weight. Almost as light as water (specific gravity 1.07); adds volume *not* weight to cement slurry; yet has little effect on setting characteristics. Is unsurpassed on field tests in bridging properties for lost circulation zones. This new material brings forth a new concept in light-weight slurry application. Be sure and get all the facts about its possible use for your operation.

HALLIBURTON CEMENTING SERVICES

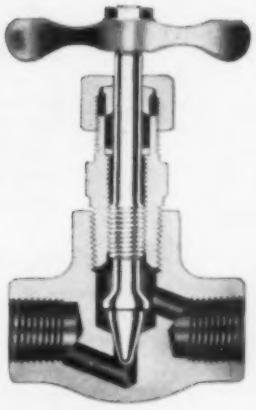
HALLIBURTON OIL WELL CEMENTING COMPANY • DUNCAN, OKLAHOMA

Rockwell-Built Edward Steel

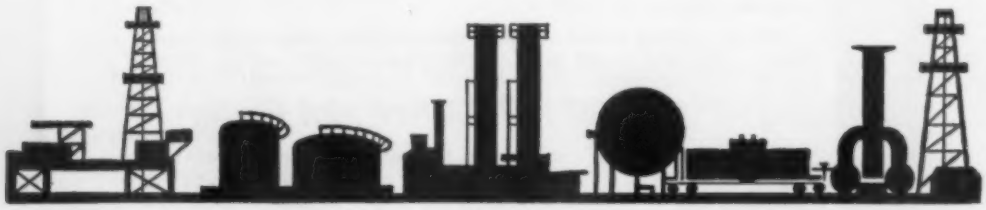


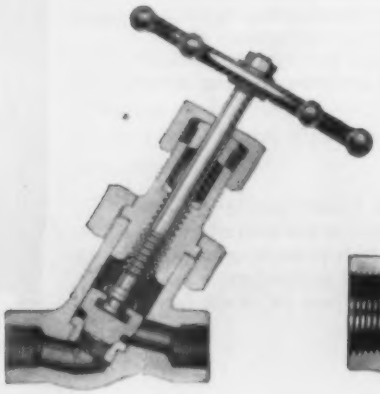
MUDWONDER MUDLINE VALVES
Figs. 2128-3128
For pressures to 2,000-3,000 lb WOG
Bolted bonnets, screwed or flanged ends

GLOBE STOP VALVE
Fig. 158
For pressures to 10,000 lb WOG
Screwed bonnet, screwed or socket welding ends

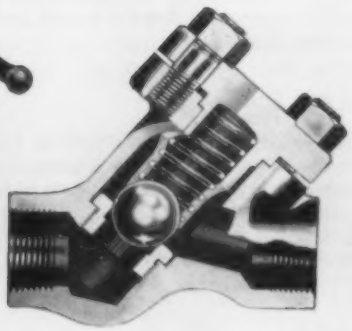


GLOBE GAGE VALVE
Fig. 152
For pressures to 4,000 lb WOG
Screwed or union bonnet, screwed ends

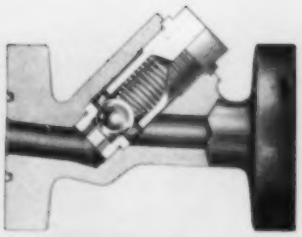




GLOBE STOP VALVE
Fig. 2698
For pressures to 2,000 lb WOG
Union bonnet, screwed or socket welding ends



BALL CHECK VALVE
Fig. 4632
For steam pressures to 600 lb A.S.A. (2,000 lb WOG)
Horizontal or vertical
Bolted cover, screwed or socket welding ends



BALL CHECK VALVES
Figs. 5160-9160
For pressures to 5,000-10,000 lb WOG
Horizontal or vertical, screwed covers, flanged ends

Valves Work Everywhere

in drilling...production...refining...

Edward valves are on the job, no matter where you look. From the towering derricks of Northern Alberta to offshore rigs on the Gulf . . . from refineries on the Jersey Flats to California natural gas plants . . . the word is—"You buy a better valve from Edward!"

Edward Globe Valves

Bodies are drop-forged steel, for greater strength and resistance to erosion. Large-diameter handwheels permit operation without a wrench or cheater; cross-arm Impactor* handle for quick, tight closing is standard on 2" Fig. 158. Figures 158 and 2698 have replaceable seats. Disks—both plug and needle types—are carefully aligned, and seats are lapped for tight sealing. Stems are EValloy,* an exclusive Edward stainless steel, centerless ground to a fine finish. Carefully machined Acme stem threads assure easy operation. Bonnet threads plated by an exclusive EValizing* process for maximum resistance to wear and corrosion. Deep stuffing boxes, with exclusive EValpak* asbestos-graphite packing, assure a tight seal with minimum resistance to stem turning.

Edward Ball Check Valves

Identical to Edward globe stop valves in body and seat features. Rolled steel bonnet with integral ribs to guide ball accurately. Ball is corrosion-resistant high carbon stainless steel, precision-ground for tight seating. High carbon stainless steel spring gives positive aid in seating ball.

Edward Mudwonder Valves

Body and bonnet are high-strength alloy steel with heavy body-bonnet cover flanges. Accurately machined to assure drop-tight sealing under extreme pressures. Double-threaded yoke bushing, completely enclosed, gives 2-to-1 ratio. Corrosion-resistant stainless steel stem with slotted gate coupling to eliminate bending or binding. Gate is hard chrome plated to reduce friction, resist erosion and abrasion. Seat insert of resilient buna-N synthetic rubber, molded integrally over steel wear rings. Seat and gate easily replaced without removing Mudwonder* from line.

WHERE CAN YOU USE EDWARD VALVES?

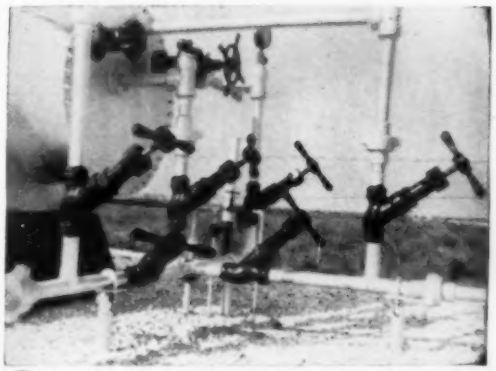
Our customers report complete satisfaction in the use of Edward valves for water flood service . . . throttling . . . on high-pressure heaters, treaters and separators . . . on pressure vessel controls . . . on headers and flow lines to heaters and exchangers . . . for manifold service . . . in gasoline or gas sulfur extraction plants . . . for "unloading" valves at gas compressor stations . . . and in many other applications. You name your need . . . let your Edward representative show how to fulfill it with versatile, economical, completely dependable Edward valves. They are available from your favorite oil field supply store, from your industrial distributor, or direct from *Edward Valves, Inc., 1200 W. 145th Street, East Chicago, Indiana* (Subsidiary of Rockwell Manufacturing Company). Represented in Canada by Lytle Engineering Specialties, Ltd., Montreal, and Rotary Sales & Service, Ltd., Edmonton.

EDWARD STEEL VALVES

another fine product by

ROCKWELL

Edward builds a complete line of forged and cast steel valves from ¼" to 18"; in globe and angle stop, gate, non-return, check, blow-off, stop-check, relief, hydraulic, instrument, gage and special designs; for pressures up to 10,000 lbs; with pressure-seal, bolted, union or welded bonnets; with screwed, welding or flanged ends. *T.M. Reg. U.S. Pat. Off.



Edward 2" Fig. 158 valves in service on heater by-pass lines in Louisiana oil fields. Note Impactor handles for quick, easy closing against high pressures.

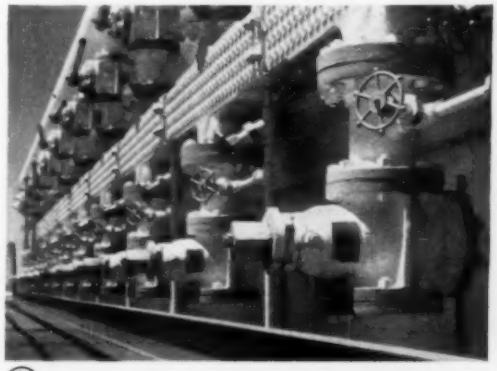
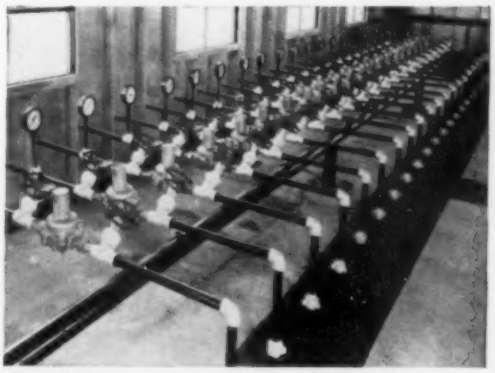


Fig. 2698 valves on cooling coils of natural gas cooler. Scene: New Mexico field processing plant. Lubricated plug valves in photo are Rockwell-Nordstrom.



Forty-two Edward forged steel globe valves (Fig. 2698) throttle the flow on this West Texas water flood. Owner reports absolutely no maintenance costs in two years (over 4,000,000 barrels of water)!

THREE ROILINE ENGINES

drilling

World's Deepest Well

...23,450 ft. and still going

ROILINE ENGINES

Phillips Petroleum Co. Rig No. 27, in Pecos County, Texas, has three ROILINE Engines

In Pecos County, Texas, Phillips Petroleum Co. Rig No. 27 is drilling the world's deepest oil well—with three L-4000 ROILINE Gas Engines.

Designed for deep hole drilling, these modern, compact gas engines have the additional power, with fast response to load demand, that makes more hole. They do it with less fuel; and maintenance is easier, too.

With their 12 cylinders in V-type arrangement, Model L-4000 ROILINES are basic valve-in-head engines of 4000 cu. in. displacement, 7.54 bore x 7.5 inch stroke, operating on gas fuel. Hydraulic "Zero Lash" valve lifters eliminate tappet noise and adjustments and extend valve life. Exhaust manifold is water cooled and integrally cast into crankcase to provide cooler operating area and fast warm-up of the engine. Removable wet cylinder sleeves; counterweighted crankshaft and precision bearings; full flow oil filters and many other ROILINE features are all fully described in Bulletin E-7.

WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN

NEW YORK TULSA LOS ANGELES

Factories at Waukesha, Wisconsin and Clinton, Iowa

397

Capacity Tripled

with only 30 days' downtime!

Kellogg Alkylation Unit Minimizes Gulf Revamp Costs

Economy-minded engineering by The M. W. Kellogg Company enabled Gulf Oil Corporation to minimize downtime and capital investment when increasing the capacity of Alkylation Unit No. 1 at its Port Arthur refinery.

Now producing 5,000 BPD of alkylate, this former 1,500 BPD unit was expanded primarily by installing two modern, five-section Kellogg Model B Cascade Reactors—shown at left. Other equipment added included pumps, exchangers, vessels, and instruments. By utilizing four original towers and much of the original equipment, costs were reduced considerably.

Despite the problem of integrating the existing equipment with the new, downtime between shutdown of the old unit and putting the expanded facilities on stream was only one month—an insignificant loss compared with savings in investment.

In this case, Gulf's own maintenance crew hooked up the new unit to the existing towers. Kellogg operators assisted in bringing the job on stream.

Kellogg welcomes the opportunity to work on your expansion or revamp projects. For prompt attention, write Kellogg's Contract Sales Division.

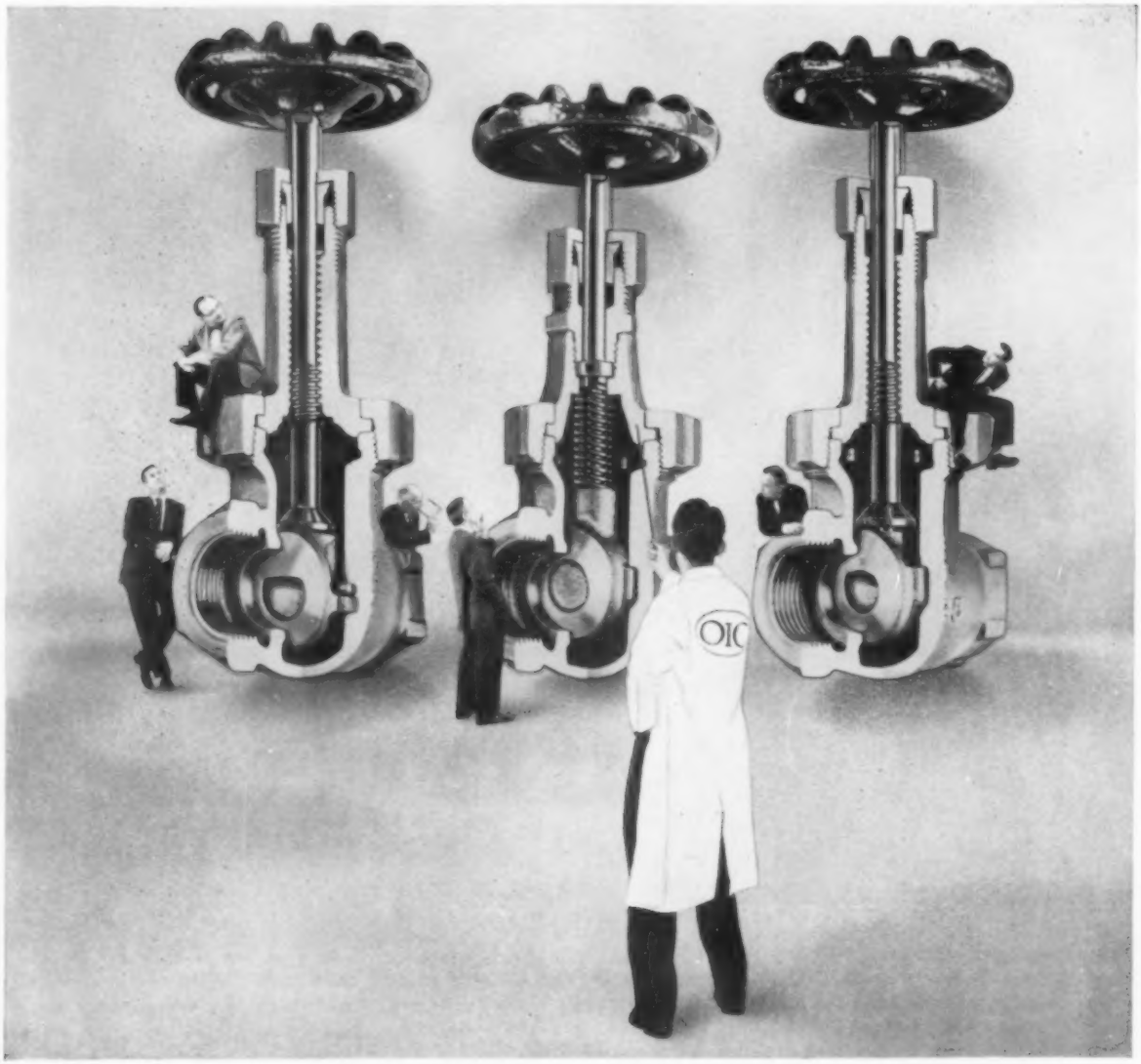
THE M. W. KELLOGG COMPANY

711 Third Avenue, New York 17, N. Y.

A SUBSIDIARY OF PULLMAN INCORPORATED

The Canadian Kellogg Company Ltd., Toronto • Kellogg International Corp., London • Kellogg Pan American Corp., New York
Societe Kellogg, Paris • Companhia Kellogg Brasileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas

...3 gate valve types in 3 pressure classes, gentlemen, all with safe, efficient (and effective) union ring joints



125 lb.—150 lb.—200 lb. OIC bronze gates . . . the most *modern*, complete line you'll find anywhere. Solid wedge—split wedge—rising or non-rising stems. All, of course, featuring OIC *alloy-40* stems which OUTLAST ORDINARY VALVE STEMS 10 to 1!

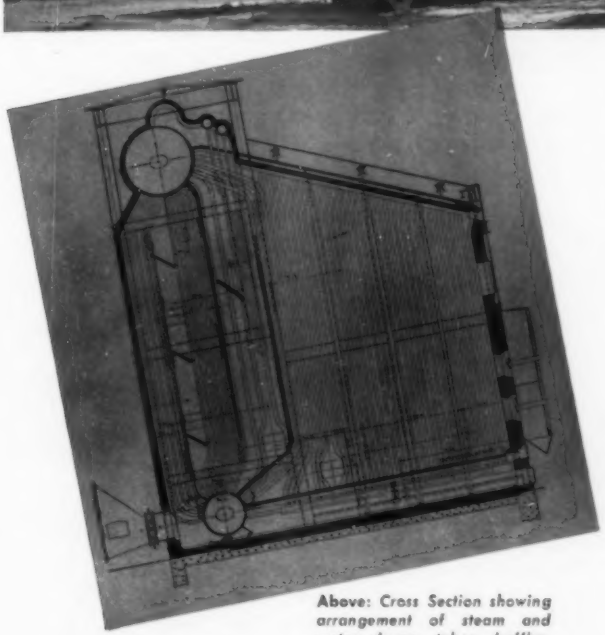
Call your OIC Distributor for quick service. Or write for specification literature.

THE OHIO INJECTOR COMPANY • Wadsworth, Ohio

OIC VALVES | BRONZE, IRON, FORGED AND CAST STEEL LUBRICATED PLUG VALVES

Vogt STEAM GENERATORS

at SUNTIDE REFINING COMPANY
Viola, Texas



Above: *Cross Section showing arrangement of steam and water drums, tubes, baffles, and furnace.*

EFFICIENCY AND ECONOMY PROVED BY FIRST 3 UNITS . . . 2 MORE ADDED!

Principle Data Each Unit

- 85,000 pounds steam per hour capacity, designed for 500 lbs. S.W.P. and 625° F. total temperature.
- Water cooled furnace.
- Burners for Gas and Oil fuel.

Vogt offers a complete line of custom built and package type steam generators. Available in bent tube and straight tube designs for solid, liquid, or gaseous fuels burned singly or in combination.

Write for bulletins. Dept. 24A-BO

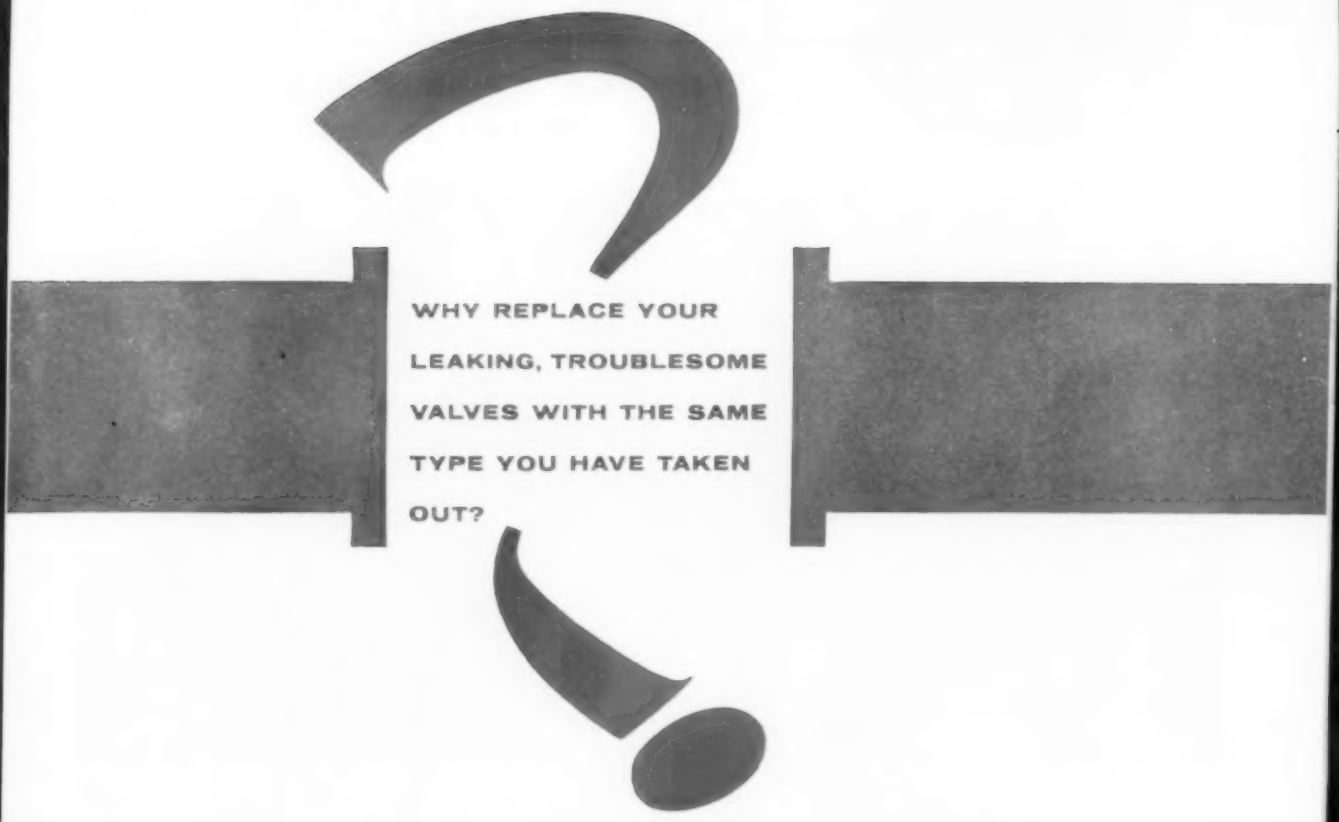
OTHER VOGT PRODUCTS

Drop Forged Steel Valves, Fittings and Flanges—
Petroleum Refinery and Chemical Plant Equipment
Heat Exchangers
Ice Making and Refrigerating Equipment

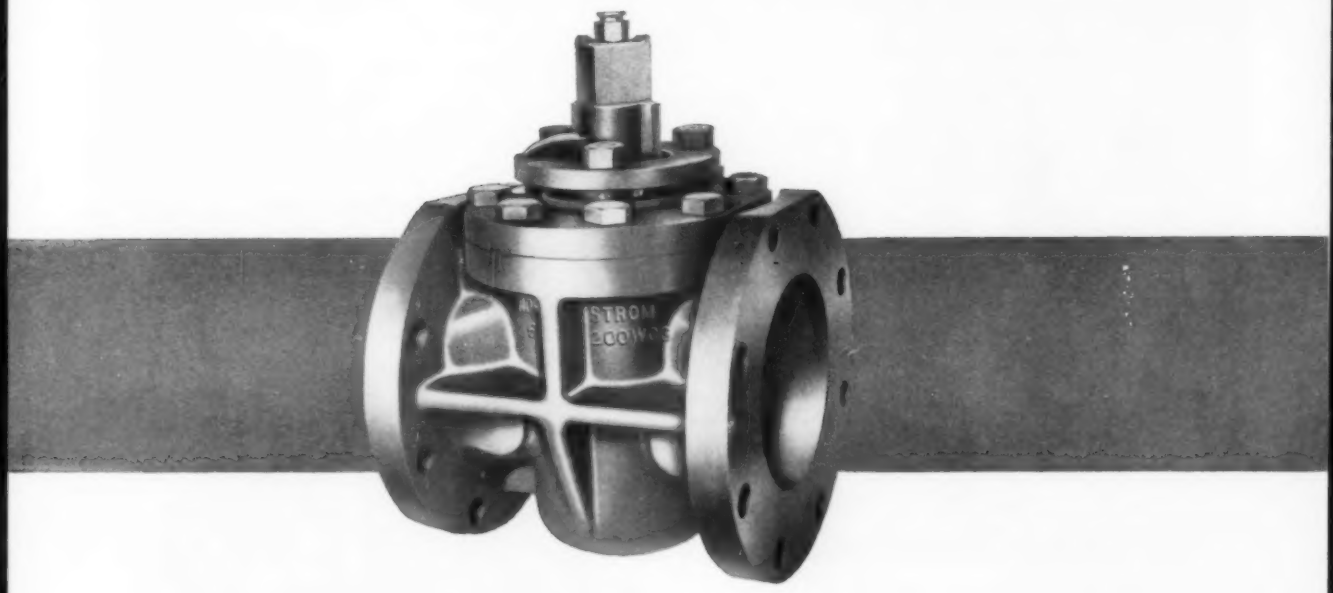
HENRY VOGT MACHINE CO.

Box 1918, Louisville 1, Kentucky

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Philadelphia, St. Louis, Charleston, W. Va., Cincinnati


WHY REPLACE YOUR
LEAKING, TROUBLESOME
VALVES WITH THE SAME
TYPE YOU HAVE TAKEN
OUT?

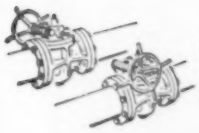
get permanent valve replacement



SPECIFY ROCKWELL-Nordstrom VALVES

Valve replacement programs are costly at best. Why replace your leaking, troublesome valves with the same type you have taken out? Insure permanent valve replacement with Rockwell-Nordstrom lubricated valves.

By replacing with Rockwell-Nordstrom valves, engineers in the gas, oil and process industries have found they can cut maintenance replacement costs *and* get better flow control in the bargain. Here are just a few reasons why they will stay in service longer, work better and cost less to use . . .



EASY REPLACEMENT:

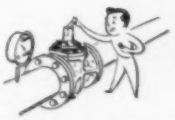
Conformance to standard lengths means no piping revision. Replacement is fast and easy.

QUARTER-TURN CLOSURE:

No bulky bonnet to damage by impact . . . closes with a lubricant-smooth 90° turn.

LEAK-PROOF:

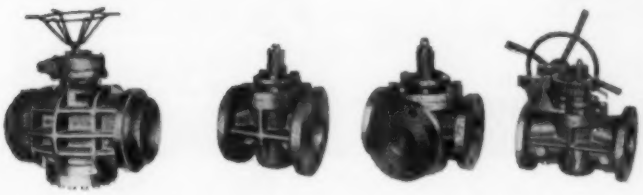
Instantly replaceable "soft seats" of pressurized lubricant insure positive shut-off.



LUBRICATED:

Lubrication is preventive maintenance . . . less wear means less repair . . . lower costs.

Rockwell-Nordstrom is the world's *most complete* line of lubricated plug valves, plug valve lubricants and accessories. Rockwell-Nordstrom valves cost no more to buy, often less, than ordinary valves. In new construction or valve replacement, they'll give you better flow control and save you money everywhere you use them. For details, see your supplier or write: Rockwell Manufacturing Company, Pittsburgh 8, Pa. *Canadian Valve Licensee: Peacock Brothers Limited.*



ROCKWELL-Nordstrom VALVES

it's ROCKWELL

MANUFACTURING COMPANY

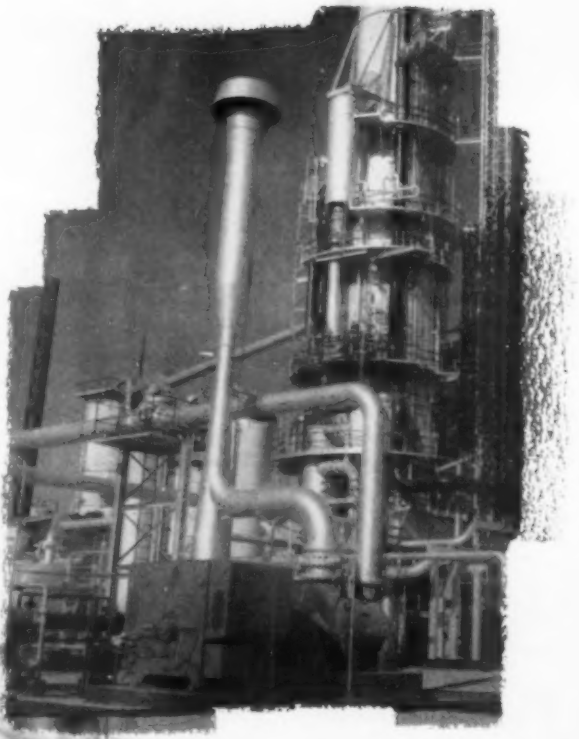
SAVE
manpower

SAVE
money

SAVE
maintenance

SAVE with Electric Versatility

Whether you need dependable electric power for a giant 2,000 hp blower drive (like the one at the right) or power for a line of smaller 100 and 40 hp pump drive motors (below) . . . you get the advantage of electric versatility and dependability with Purchased Electric Power. High continuity of service and power when and where you need it offer multiple savings you should investigate. Call your nearest Utility Electric Power Company for details or write us.



1928 – 1958
30
PEPA

Purchased Electric Power . . .
saves money, manpower, maintenance
and serves you better automatically

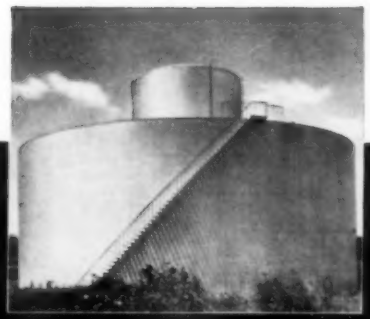
Petroleum Electric Power Association
P.O. BOX 35006, DALLAS 35, TEXAS

GRAVERSPHERES are used to store natural gasolines and volatile liquids including butane, butadiene, etc. They are ideal for storing gases—sustaining pressures up to 100 psi. and greater. Capacities range from 500 to 20,000 bbl.

GRAVER EXPANSION ROOF TANK eliminates breathing losses and minimizes filling losses. Its positive liquid seal, exclusive with Graver, protects under all conditions. Ideal for converting existing tankage, and simple to maintain, the Expansion Roof Tank may well protect an entire terminal.

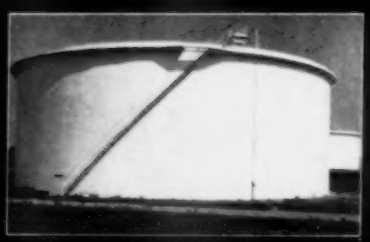
there is a GRAVER *CONSERVATION DESIGN*

to fit every need!



Graver manufactures a number of conservation designs allowing you to specify what suits your exact needs. Thus your tankage can be "tailor-made" to obtain optimum efficiency and maximum economy in operation. For authoritative assistance with your conservation problems, consult your nearest Graver Sales Engineer.

GRAVER VAPOR-MIZER is an economical design that conserves vapors, using less steel in building and requiring smaller vapor lines in manifolded tankage.
The VAPOR-MIZER helps maintain the fresh quality of your product! As it operates at very low pressures, the reinforcement of manifolded tanks becomes unnecessary.



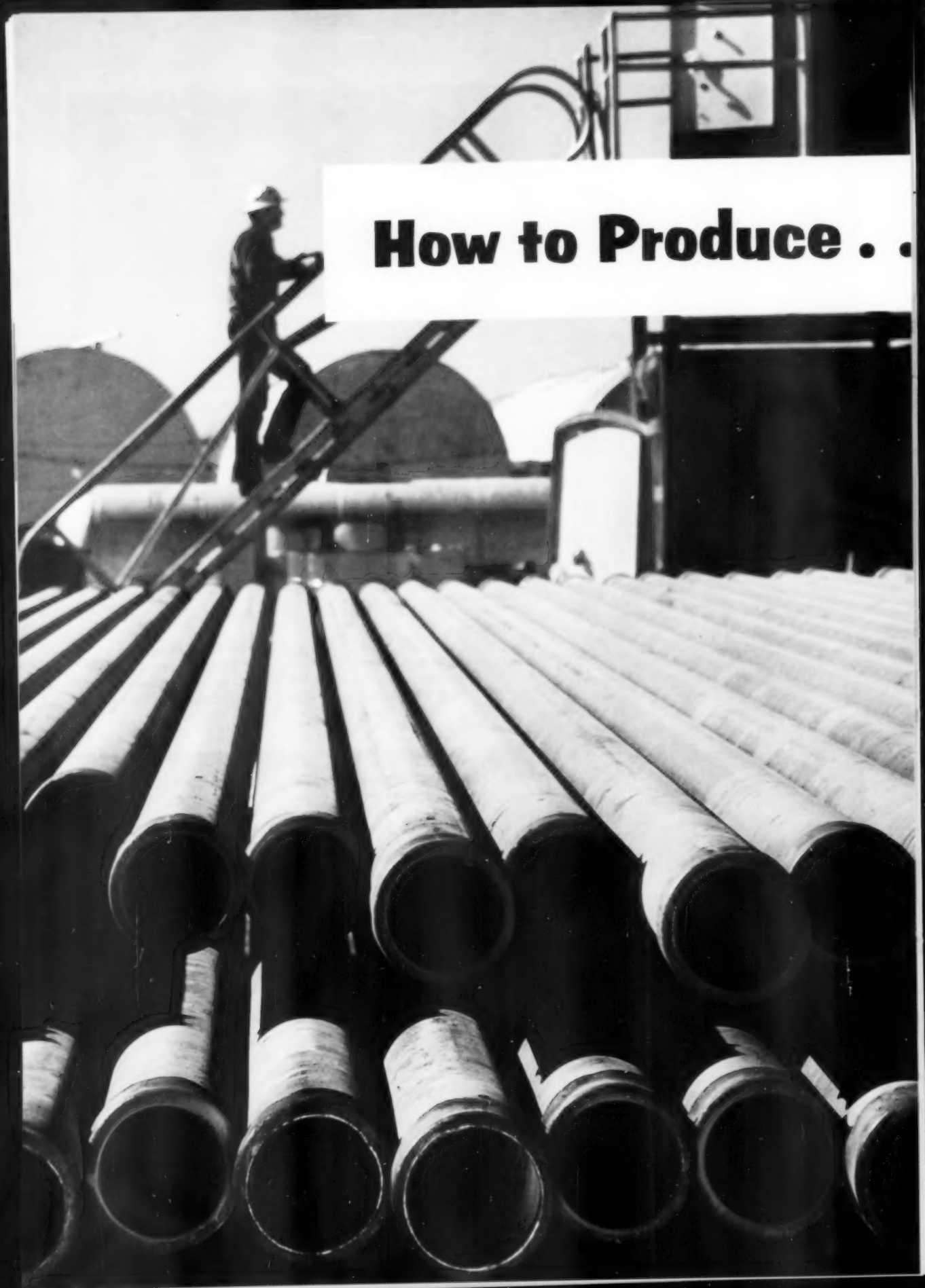
GRAVER DOUBLE-DECK AND CENTER-WEIGHTED FLOATING ROOF TANKS are two separate designs in which the roof floats directly on the liquid, preventing the formation of vapors. They are applicable to crude and product storage areas at refineries, terminals and large bulk installations.

GRAVER®

Building for the Future on a Century of Craftsmanship in Steels and Alloys

GRAVER TANK & MFG. CO., INC.

EAST CHICAGO, INDIANA • New York • Philadelphia
Edge Moor, Delaware • Pittsburgh • Atlanta • Detroit • Chicago
Tulsa • Sand Springs, Oklahoma • Houston • New Orleans
Los Angeles • Fontana, California • San Francisco


How to Produce . .

. . . . . for More Profit

J&L SEAMLESS CASING and TUBING have uniform high quality, the result of quality controlled manufacturing. Beginning at the iron ore mine and continuing through the basic steel making operations and the finishing mills, this quality control adds up to **dependable service** for you. J&L tubular goods will give you long trouble-free production . . . more profit for your investment.

J&L API Seamless Casing in Grades H-40 through P-110
J&L Buttress Thread Casing Grades J-55 through P-110
J&L Extreme Line Casing Grades J-55 through P-110
J&L API Seamless Tubing in Grades H-40 through P-105
J&L Integral Joint Tubing Grades J-55 through P-105
J&L Grayloc Tubing Grades J-55 through P-105

To complete a profitable production picture, check these quality products supplied by Jones & Laughlin:

Cabot Pumping Units . . . a complete line
Century Electric Motors . . . a full range of sizes
Axelson Rods and Pumps . . . tailored to your requirements

Supporting this quality product line are J&L Supply men, fully qualified, resourceful and interested in your production problems.

Let them show you how **high quality products** and **dependable oil field service** add up to more profit for you.

Contact your local J&L Supply man . . . or write us direct at Drawer 2481, Tulsa.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

If it's sold by J&L . . .
it's the best available

Adequate stocks at key points . . .

assure prompt delivery . . .

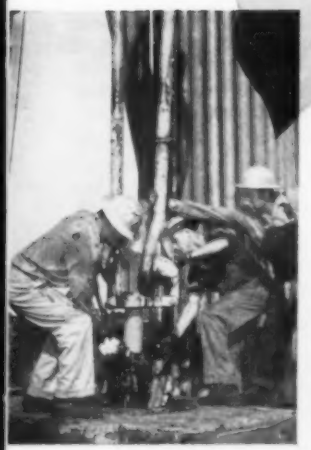
to your locations.

You and I <u>both</u> belong here! After all, there wouldn't *be* any busy highways without us! I'm a secretary to a land man. You may be anything from a driller to a board chairman. Between us we helped keep over 50 million cars on the road last year. People used them for fun, convenience, business. Remember that, the next time you hear unfair criticism of us oilmen. We've got lots of facts on our side. Let's speak up and make the facts known! **SHELL OIL COMPANY**

SHELL

MORE WAYS THAN ONE

TO BE AN OIL MAN



Ask the toolpusher what he is, and he says he's an oil man. Ask the mud dealer, the wire line operator, the supplier. Ask the tool rental man, ask the man 'dozing the slush pits, the drilling contractor, the producer. They are all oil men. And the oil industry depends on all of them and many more.

The Oil and Gas Department of The National Bank of Commerce of Houston has helped and is helping all of these oil men. The Commerce can help you because it knows what it's talking about, and, even more important from your point of view, it knows what *you're* talking about. If you are planning to drill, if you are planning to extend needed services, if you are in the oil business, you'll find that The National Bank of Commerce will help you all the way.

E. O. Buck, *senior vice president*
Oil and Gas Department.

THE NATIONAL BANK OF

COMMERCE

OF HOUSTON

GULF BUILDING MAIN AT RUSK HOUSTON

Facilities of the Oil and Gas Department of The National Bank of Commerce of Houston are available in Wyoming, Nebraska, Colorado, New Mexico, Louisiana, Mississippi, and Texas.

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

In the Field—Salesman "Riney" Rinehart (right) gains firsthand knowledge of drilling. Driller Earnest Mann points out excellent wear received from Pittsburgh Drill Pipe and Tool Joints. "Riney's" field work means . . .

Good Service Is the Secret of Success for Pittsburgh Steel's Independents

Back in Indiana some 58 years ago, his parents named him Wallace Chester Rinehart. Since then, 35 years in Oklahoma and Texas oil fields have trimmed his name to just "Riney."

That's how he's known to thousands of oilmen in the fields of North Central Texas where he manages one of the largest independent oil field supply stores.

A Texan for nearly 30 years, Riney has spent the last 14 as store manager of a Pittsburgh Steel Company independent distributor.

He knows oilmen, their needs and the merits of the products he sells. Proof of this is found on a plaque displayed in his office. It cites Riney for "outstanding service" to the supply end of the oil business.

Being with Riney any length of time quickly convinces one that these words from the plaque—"outstanding service"—are really his key to success.

More than for Riney alone, these words also sum up the reasons behind success of the entire 65-member organization he is with.

For, if other companies started on a shoestring, Riney's outfit started on half a shoestring. Its first store was a two-story frame building that once had been a freight station and then a grocery warehouse. Rent was $25 a month, but leasing part of the space to a local taxi firm brought in $15 of this.

• **String-At-A-Time**—To hold inventories in line with cash on hand, pipe was bought a string at a time. And since the office adjoined the railroad yards, Riney's bosses could look out their windows to spot car numbers on incoming freight trains. When numbers matched their shipping notices, they hustled out and sold the shipment, even before it had to be unloaded. That produced enough money for the next string.

As precarious as it was, this system worked so well that within 2 years after the store's opening, it was able to order its first solid trainload of Pittsburgh Seamless. That was in 1935. And it has been handling Pittsburgh oil country goods ever since.

When nearby KAMAY field opened, 48 of the first 50 strings sold there were from Riney's company. Stressing service and quality products, the company has grown steadily since then. Sales now are expressed in millions of dollars a year. Seven stores handle upwards of 1500 customers.

By keeping emphasis on its first main product—pipe—Riney's company achieves a rapid turnover on what amounts to half its inventory.

Riney agrees with principals of his company when they set down this list of advantages offered by the independent distributors shown at right:

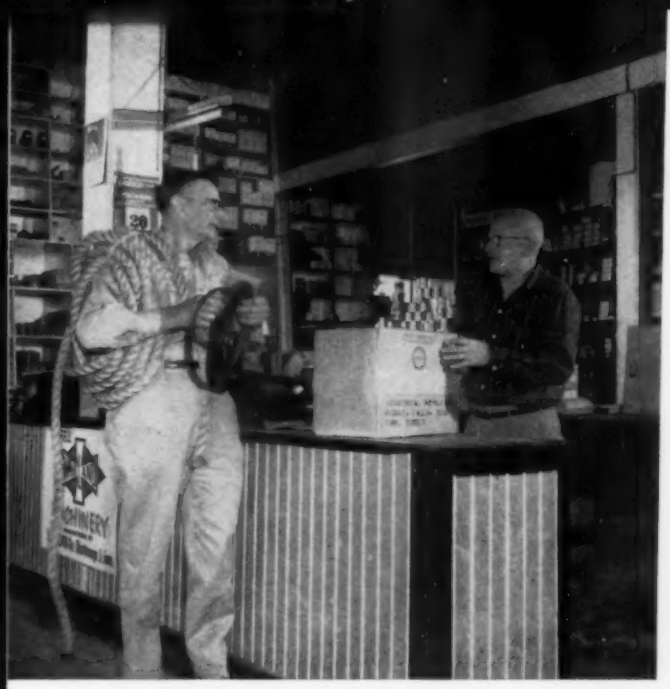
1. An independent's stores are the first in a field and the last to leave. Proof: Riney's company still maintains a KAMAY store, even though the field is completely developed.

2. The independent is a local businessman. His success in any one community depends on his reputation for service and quality.

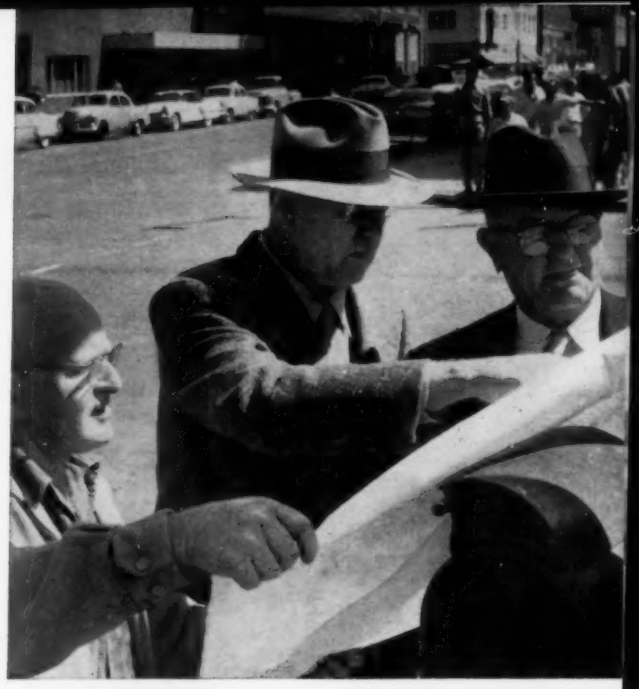
3. The independent knows the field he's serving. For example, Riney stresses the importance in his area of the good quality, metallurgically controlled resistance to corrosion material provided by Pittsburgh Seamless.

4. Independents support the community where they live and work. Several principals in Riney's company hold important volunteer civic jobs.

5. Business decisions requiring detailed understanding of specific prob-



In the Store—"Riney," manager of one of the largest independent inland supply stores, knows what products will be needed by customers. As an independent, he is free to stock only the best products, such as Pittsburgh Seamless. The best in products and service is offered. . .



Even on Street Corner, "Riney" gives service. Here he checks maps of a new drilling location with drilling contractors Charles E. Morrison and Jack Grace. "Riney's" company has been handling Pittsburgh Seamless oil country goods since 1935.

lems are made quickly. A commercial decision in Riney's company takes only the time required to walk 50 feet from sales counter to the president's office.

6. Versatility. Riney offers for sale an inventory his company feels is the largest of any inland store. "Our customers know we have the part they need and this keeps costly drilling delays at absolute minimum," he says.

7. Location. Being in the heart of the producing area where oilmen transact their business, Riney gives maximum service.

Riney sums it up this way:

"Pittsburgh Steel helped us grow in the supply business by shipping us pipe that meets API specifications more consistently than that of most other producers.

"The pipe we need around these parts has to be rugged. Pittsburgh's tubing, especially with that (blackening) coating is as good as any made. We don't have any trouble with the Pittsburgh Seamless Casing we sell due to the high quality materials we receive. And the drill pipe holds up as well, if not better than any, especially under the severe stresses to which it is applied.

Riney and the independent he works for are typical of the more than 140 stores handling Pittsburgh Seamless. They specialize in service, help keep drilling costs low. An independent's prices are in line because his livelihood depends on meeting competition. He offers only the best in equipment because he is free to buy only what he wants to buy. And equipment manufacturers back up their independent distributors.

Riney's company is typical of the distributors listed on the right. So, next time you buy drill pipe, casing or tubing, use the combination that can't be beat—independent distributors—handling Pittsburgh Seamless.

Distributor Home Offices

Bradford Supply Company
Bradford, Pennaylvania

Buckeye Supply Company
Zanesville, Ohio

Cardwell Manufacturing Co.
Wichita, Kansas

C. W. Cotton Supply Company
Tulsa 5, Oklahoma

Franklin Supply Company
Chicago 5, Illinois

Houston Oil Field Material Co.
Houston, Texas

Industrial Supply Company
Wichita Falls, Texas

Iverson Supply Company
Tulsa, Oklahoma

Longhorn Supply Co., Inc.
Houston 14, Texas

Lucey Export Corporation
New York 7, New York

Lucey Products Corporation
Tulsa 19, Oklahoma

McJunkin Corporation
Charleston 22, West Virginia

Midland Supply Company
Wichita 7, Kansas

Mountain Iron & Supply Co.
Wichita 2, Kansas

Murray Brooks, Incorporated
Lake Charles, Louisiana

The Producers Supply & Tool Co.
Fort Worth 2, Texas

Production & Refining Equipment Co.
Odessa, Texas

Sandy Supply Company
Wooster, Ohio

Southwest Supply Company
Pittsburgh, Pennaylvania

Superior Iron Works & Supply Co.
Shreveport, Louisiana

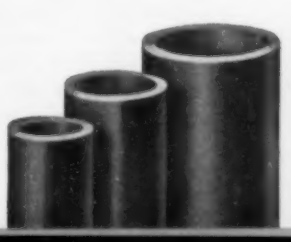
Western Supply Company
Tulsa 1, Oklahoma

Pittsburgh Steel Company

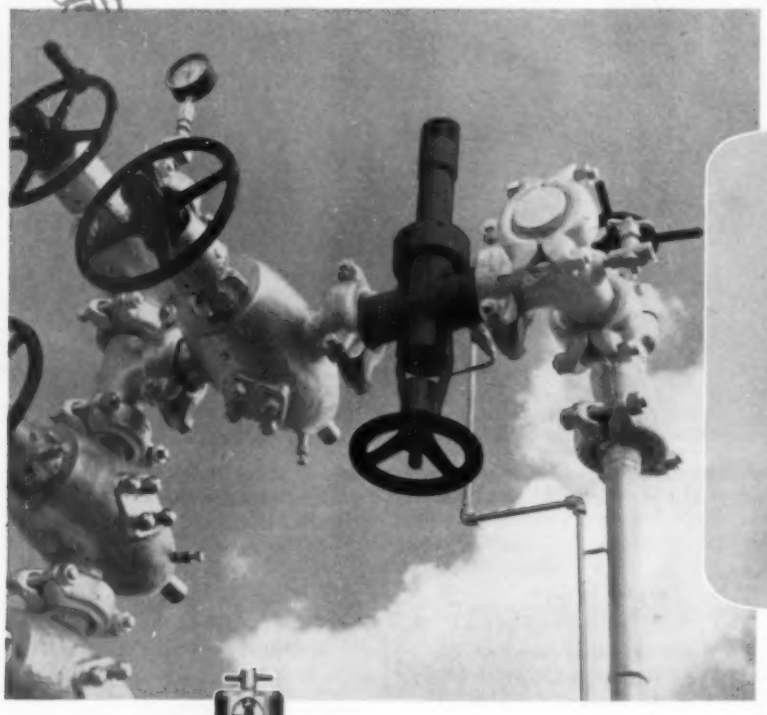
Grant Building • Pittsburgh 30, Pa.

District Sales Offices

Atlanta	Cleveland	Dayton	Los Angeles	Pittsburgh
Chicago	Dallas	Detroit	New York	Tulsa
		Houston	Philadelphia	Warren, Ohio

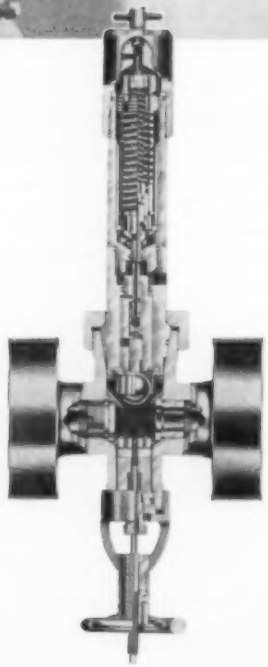


sentinel over 10,000 psi



SAFOMATIC VALVE

PROVIDES DOWNSTREAM PROTECTION ON THIS HIGH PRESSURE PRODUCER OF UNION OIL & GAS CORPORATION OF LOUISIANA



Union Oil & Gas Corporation of Louisiana played it safe when they hooked up their Roach No. 2. Forewarned of exceedingly high bottom hole pressure they installed a 30,000# test, 15,000# W.P. SAFOMATIC VALVE upstream of the choke. Now, even with flowing pressures hovering around 10,000 psi and with the SAFOMATIC VALVE standing sentinel, that pressure is under absolute control . . . downstream installations are as safe as those on a pumping well. Because the instant that pressure varies up or down beyond a pre-set, critical point, the SAFOMATIC VALVE will close and shut in the well as securely as any master valve.

It's real protection that Union Oil & Gas has on their Roach No. 2. You can have the same by installing SAFOMATIC VALVES on your wellheads or pressure systems.

Safomatic Valves are furnished for working pressures from 1000 psi to 15,000 psi; screwed, flanged or special connections; regular or corrosion-resistant materials; standard or remote-control types. Sizes, 2" through 4". For complete information, ask your GOT representative or write for descriptive literature.

got

Garrett Oil Tools, Inc.

P. O. BOX 2427 • LONGVIEW, TEXAS

USI

DIVISION OF U. S. INDUSTRIES, INC.

Major South Texas Operator* Achieves 22% Increased Condensate Recovery With...

BS&B Model GDH "COLD-FRAC" Units

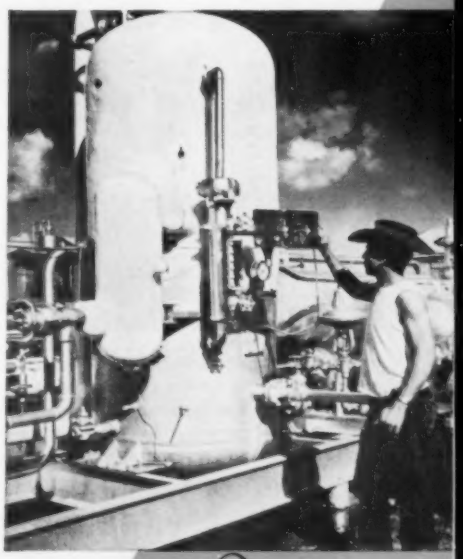
Down in Kleberg County, Texas, a major lease operator had 10 shut-in gas condensate wells which were to be put "on stream". The problem was to extract the *maximum* amount of condensates consistent with the *lowest* possible cost, and to lower water dewpoint of the gas to below pipeline contract specifications before it reached the sales line.

Three BS&B Model GDH "COLD-FRAC" Units were installed with stage separation capacity totalling 40 MMSCFD. Based on the following flow conditions, condensate recovery from the 10 wells increased 22% over conventional separation and water dewpoint is well within maximum limits:

Low Temperature Separator:
Operating at 855 psig and 11° F. top—51° F. bottom.

Gas Capacity:
40 MMSCFD maximum.
Operating at 25 MMSCFD with 2960 psig flowing pressure and 106° F. flowing temperature.

*Name furnished on request



If you are not now using a BS&B Model GDH "COLD-FRAC" Unit on your lease, get your nearby BS&B Man to make a complete engineering analysis of your lease production to determine the potential increase in condensate recovery you could realize from a GDH installation! Why not call him now?

OVER 60 YEARS EFFICIENCY BS&B RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.

Oilfield Equipment Division, Dept. 1-A10A
P. O. Box 1714 Oklahoma City, Oklahoma

OPTIMUM DESIGN...

of YUBA HEAT EXCHANGERS achieved by COMPUTER SYSTEM

Into Yuba's Central Computer System go the temperatures and pressures your heat exchangers must handle, flow quantities and fluid properties, tube layout, allowable pressure drop, and nozzle connections.

Out comes the number in series, shell size, minimum number of segmental baffles, optimum number of tube passes, calculated pressure drop, heat transfer rate on both shell and tube sides, and the corrected LMTD. Elapsed time: 15-20 minutes with the computer as compared to days with the slide rule.

No guesswork! Optimum results with absolute accuracy. Also...we can extract from the Yuba Computer System all kinds of alternates for you: alternate flow quantities, alternate temperatures, and alternate tube construction (fin or bare). This central computer system is used by all Yuba divisions manufacturing heat exchangers.

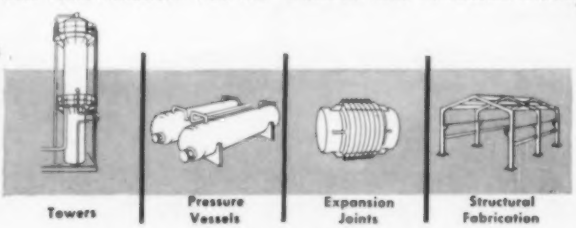
YUBA HEAT TRANSFER DIVISION, Honesdale, Pa.; ADSCO DIVISION, Buffalo, N. Y., and YUBA MANUFACTURING DIVISION, Benicia, Calif.

YUBA CONSOLIDATED INDUSTRIES, INC.

OTHER YUBA PRODUCTS FOR THE CHEMICAL AND PETROLEUM INDUSTRIES.

YUBA

Plants and Sales Offices



Towers | Pressure Vessels | Expansion Joints | Structural Fabrication

THE PARKERSBURG RIG AND REEL CO.
PARKERSBURG WEST VIRGINIA
MADE IN U.S.A.

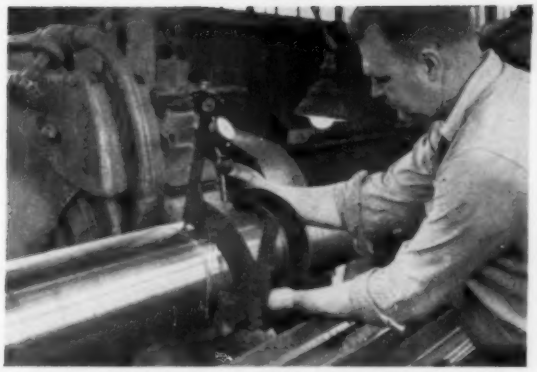
QUALITY and PERFORMANCE

are Engineered and Built into PARKERSBURG Pumping Units

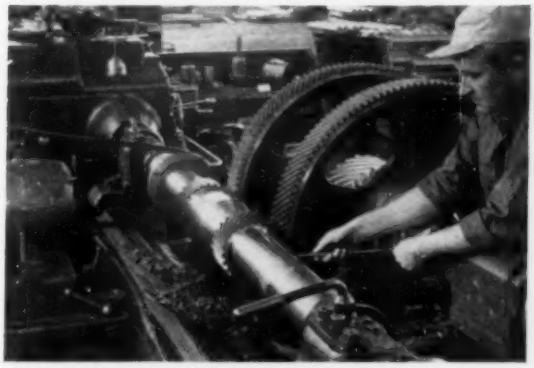
The dependability that makes Parkersburg Pumping Units top choice in the field begins on the drawing board and continues through all manufacturing steps. Here are typical shop scenes showing why you can depend on quality-built Parkersburg Pumping Units with herringbone gear reducers.

Quality Control from Design to Completed Pumping Unit Makes a PARKERSBURG

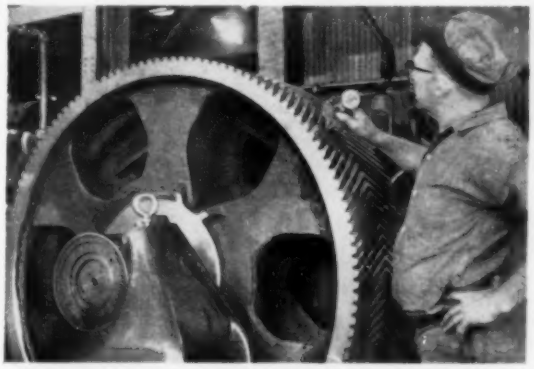
YOUR BEST BUY



Inspector checking ground shaft for accuracy. Parkersburg Pumping Units are made to exacting specifications.

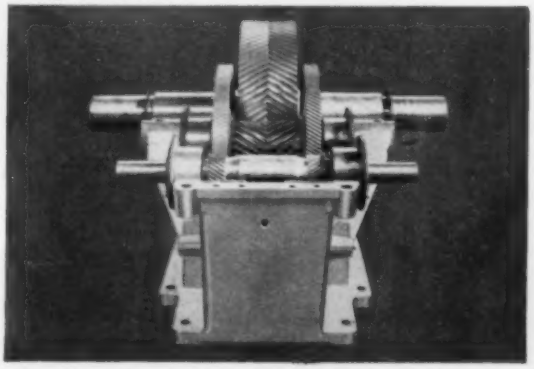


Constant inspections at all stages of construction insure dependability. Inspector here is checking centers on lapping machine.



Checking gear teeth with comparator gauge. This assures proper angle for strength and freedom from undercutting.

Interior of "split case" reducer showing symmetrical arrangement of gears about centerline of reducer, a product of quality design and control.

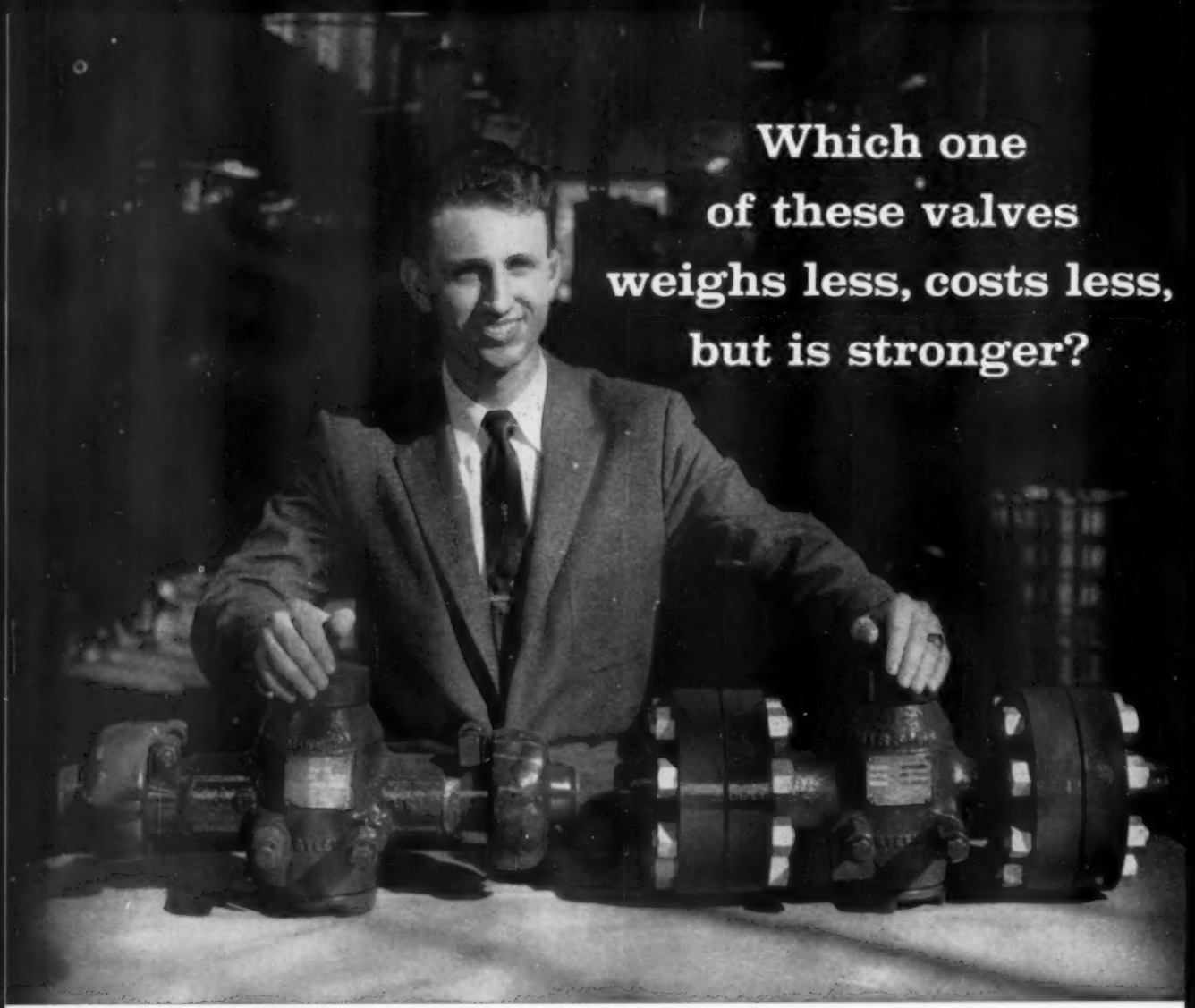


THE PARKERSBURG RIG & REEL COMPANY
Division of Parkersburg-Aetna Corp.
Pumping Unit Division Offices:
710 Mid-Continent Building Tulsa, Oklahoma

PESA
PARTNERS IN PETROLEUM PROGRESS

Parkersburg Pumping Units are available through the following supply stores:

Beacon Supply Co., Bovaird Supply Co., Canadian Equipment Sales & Service Co., Ltd., C. W. Cotton Supply Co., Franklin Supply Co., Houston Oilfield Material Co., Inc., Industrial Supply Co., Iverson Supply Co., Midland Supply Co., Inc., Mountain Iron and Supply Co., Murray-Brooks, Inc., The Producers Supply & Tool Co., Rodman Supply Co., Superior Iron Works & Supply Co., United Supply & Manufacturing Co., Wilson Supply Co.



Both of these valves are of the same make, model, size, and pressure rating. One is equipped with 2", 6000 lbs. test, Unibolt Couplings, the other with 2", Series 900 flanges. The Unibolt-equipped valve weighs 102 lbs. less, costs about 10% less, and is approximately 28% stronger!

And the advantages don't stop there. Because it weighs less, the Unibolt-equipped valve costs less to ship and is easier to handle, easier to install. (Two bolts and nuts, compared to 16 bolts and 32 nuts.)

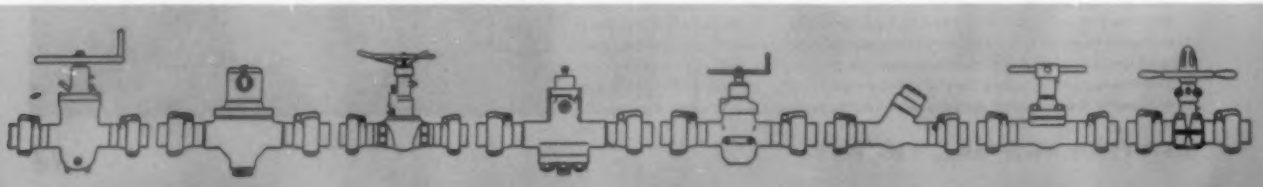
Unibolt Couplings are easy to attach to any valve. Either hub of the Coupling may be butt-welded, socket-welded or screwed to the valve body.

Even if steel were plentiful, Unibolt-equipped valves—as opposed to flanged valves—would be your best buy.

THORNHILL CRAVER CO.

P. O. Box 1184, Houston, Texas

ask your supplier to furnish unibolt-equipped valves



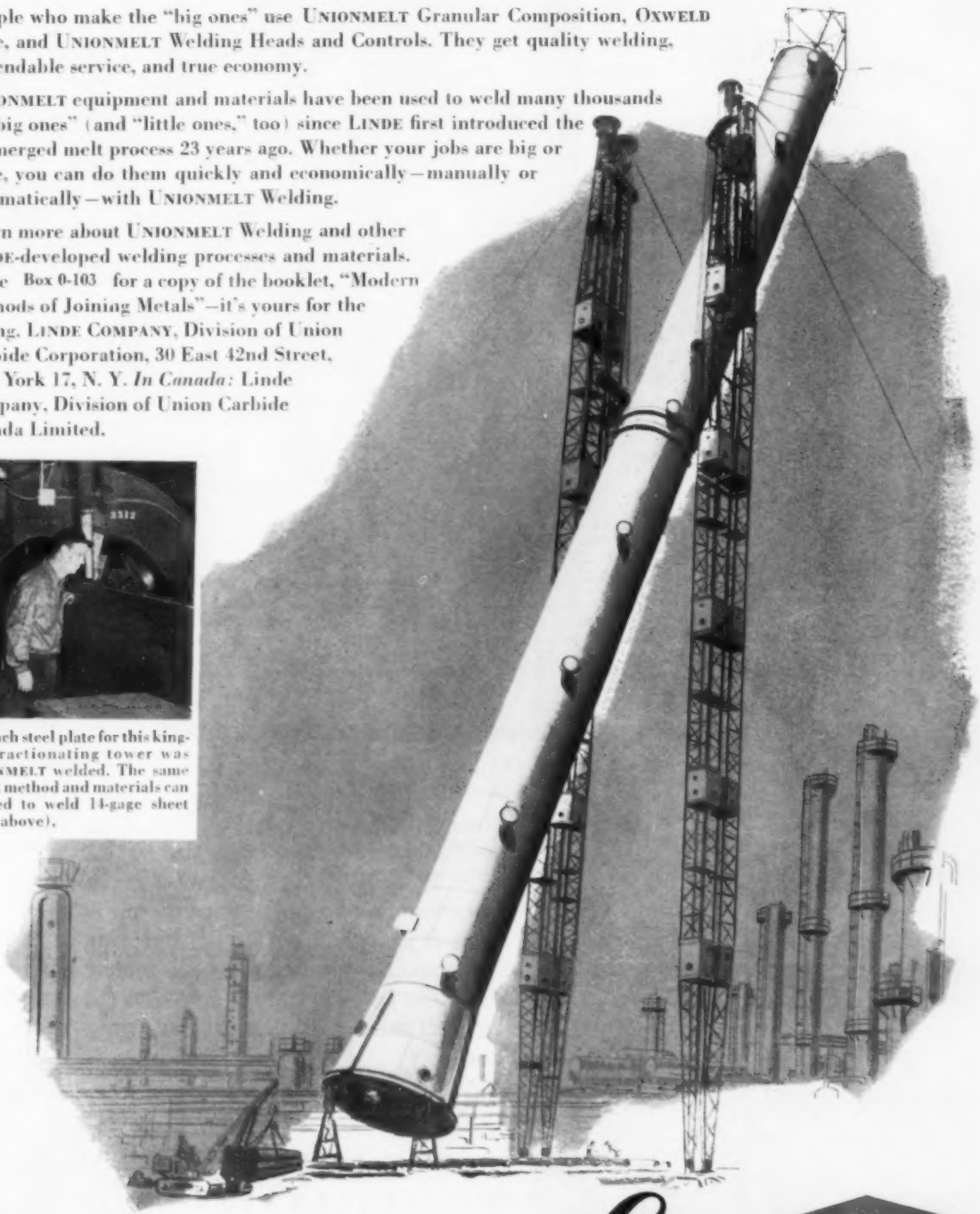
UNIONMELT Welding
makes short work of tall towers

People who make the "big ones" use UNIONMELT Granular Composition, OXWELD Wire, and UNIONMELT Welding Heads and Controls. They get quality welding, dependable service, and true economy.

UNIONMELT equipment and materials have been used to weld many thousands of "big ones" (and "little ones," too) since LINDE first introduced the submerged melt process 23 years ago. Whether your jobs are big or little, you can do them quickly and economically—manually or automatically—with UNIONMELT Welding.

Learn more about UNIONMELT Welding and other LINDE-developed welding processes and materials. Write Box 0-103 for a copy of the booklet, "Modern Methods of Joining Metals"—it's yours for the asking. LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. *In Canada:* Linde Company, Division of Union Carbide Canada Limited.

One-inch steel plate for this king-size fractionating tower was UNIONMELT welded. The same LINDE method and materials can be used to weld 14-gage sheet steel (above).



Linde

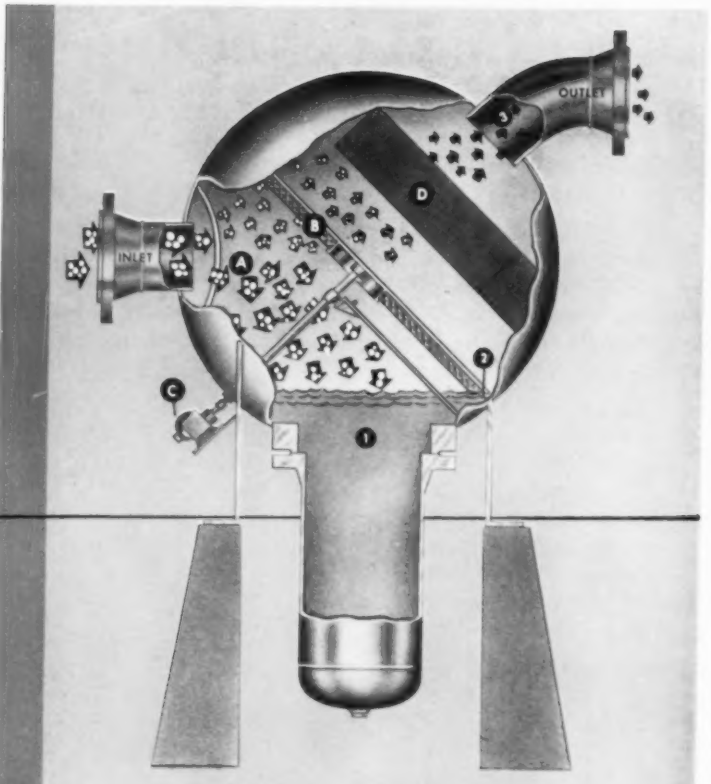
UNION CARBIDE

The terms "Linde," "Unionmelt," "Oxweld," and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

MORE EFFICIENT RESULTS!

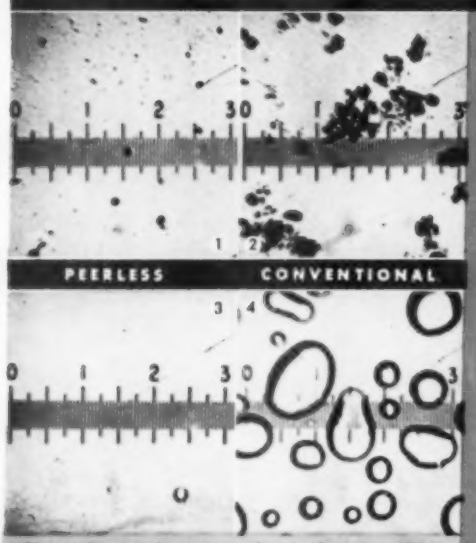
PEERLESS SCRUBOSPHERE*

*Spherical scrubber for dust and liquid removal from gas flow



LEGEND OF ABOVE CUTAWAY

The majority of incoming liquid (A) and solid particles are directed to either side and down into reservoir (1). Lighter solid particles carried by gas stream are separated on surfaces of contactor (B) which are kept wet and clean by revolving thru liquid reservoir (2). Contactor is revolved by explosion-proof gear motor (C). Mist Extractor (D) removes any remaining liquid particles from gas stream prior to outlet (3).



These photographs were made of microscope slides introduced downstream of the Scrubosphere and a conventional vertical oil bath cleaner under the same operating conditions. Plates 1 and 2 show the comparative amounts of iron oxide not removed with the amounts introduced being identical. Plates 3 and 4 indicate comparative oil loss with vapor rate through the vessels being the same.

LOOK AT THIS TEST The test at the left indicates the superiority of Peerless Scrubosphere over conventional oil bath dust scrubbers. The SCRUBOSPHERE operates with no loss of efficiency at low flows, minimum liquid loss, and very low pressure drop. Other outstanding features include easy vessel access with removable self cleaning contactor, a sump for slugs of solid or liquid particles, and minimum cost.

For detailed information write for Bulletin No. 180

PEERLESS MANUFACTURING CO.

P.O. Box 13165 Dallas, Texas

Representatives in All Principal Cities

PEERLESS MFG. CO. DALLAS TEXAS

"OVER 20,000 SEPARATORS and SCRUBBERS IN SERVICE"

News and Notes on...

Good Packing Practice

JOHNS-MANVILLE JM PRODUCTS

Maintenance and Design Hints from Johns-Manville Packings and Textiles Dept.

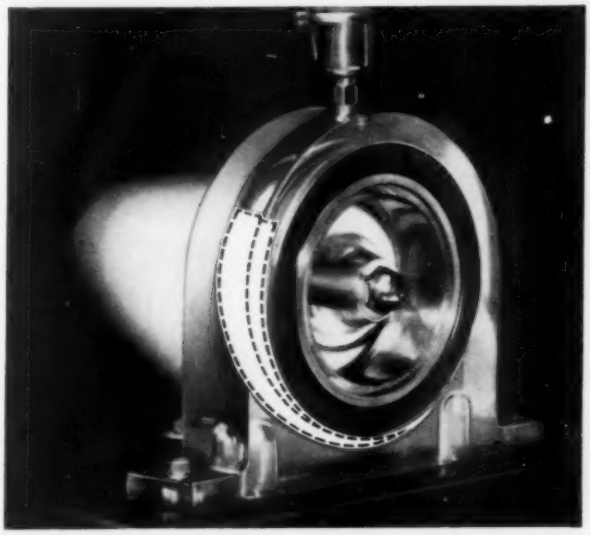
Subject of the month: Effective Shaft Sealing

Question: What is an economical way to seal in or seal out with maximum efficiency?

Whether the shaft bearing is of the sleeve, roller, or ball type . . . seals should meet two basic requirements: (1) provide a tight seal despite light applied pressure, and (2) resist abrasion and corrosion.

The transparent unit shown at the right was created by research engineers to study this subject of effective sealing . . . witness the performance of J-M seals in development stages. It helped them perfect the versatile, dependable line of J-M Clipper® Seals that serve many industries.

In this unit, Clipper Seals are mounted on a transparent cylinder, just as in a bearing cavity. The heel of the seal provides the rigidity essential for a press fit. The lip is flexible and soft so as to snug the shaft with a minimum of friction. Thus it acts like a gasket and effectively stops leakage.



HERE ARE JOB-TESTED RECOMMENDATIONS FOR COMMON SEALING APPLICATIONS:

For General Service—Type LPD All Purpose. This line-contact Clipper Seal provides long life and maximum sealing effectiveness under a wide range of equipment variables. Its synthetic rubber base compound is recommended by J-M for most sealing lip applications where combined ambient and operating temperatures reach 250°F and higher. It seals practically all fluids . . . has proved highly effective against oils and greases, hot and cold water, air and many other gases and vapors. And it maintains its high efficiency despite time, high temperatures, and adverse conditions.

For Small Clearances—Split Clipper Seals. Split Clipper Seals have wide acceptance as temporary replacement seals for equipment with space or design limitations . . . to save costly downtime. Installation in inaccessible space is relatively simple and speedy. They are practically fracture-proof . . . stand up under the rough treatment . . . can be forced into position around the shaft. They give long-term, efficient sealing until a major overhaul permits replacement with solid seals.

For further data on Clipper Seals write for Book PK-71A. Address: Johns-Manville, Box 14, New York 16, N. Y. In Canada: Port Credit, Ontario.

For Continuous High Speed Operations—Type LPD Metal-Reinforced. This Clipper Seal, incorporating a metal reinforcement, is ideal for use in continuous high speed and extremely abusive service such as encountered in the steel industry. It expands and contracts with the chuck in which it is installed. It is a combination of two synthetic rubber base materials that are highly resistant to cracking, hardening and shrinking.

For Small Shaft Diameters—Type SS Springless. Here's the Clipper Seal designed for smaller cavities. It is made of a selected synthetic rubber base compounded to minimize swell and deterioration in corrosive applications where chlorinated solvents, lubricating oils carrying severe additives, or similar aggressive fluids must be sealed. It is a complete part in itself—contains no metal spring. No spring is required because this seal is designed to exert sufficient lip interference on the shaft to compensate for wear over a long period of time.

JOHNS-MANVILLE

100 YEARS OF QUALITY PRODUCTS . . . 1858-1958

USCOFLOW PLASTIC PIPE

New black UscoFlow Utility plastic pipe and fittings provide economical corrosion resistance—inside and out

A blend of styrene-base resins and synthetic rubber to give good impact resistance and high, effective tensile strength...

A simple installation—rapidly solvent welded...

A friction-free finish that maintains high flow-rate and resists build-up of scale or other deposits...

An economical price to solve corrosion and high installation cost problems that would ordinarily chew into your profits...

All this is the *new* UscoFlow line of black plastic pipe and fittings, specially designed for economical and efficient handling of fluids. It has already proven its long service life, free of maintenance and downtime, and is recommended for such applications as

salt-water lines **fresh-water lines***
natural-gas lines **electrical conduit**

• • •

When you think of plastic, think of your "U. S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and quality plastic pipe and fittings.

**Uscolite is approved by the National Sanitation Foundation for use with potable water.*

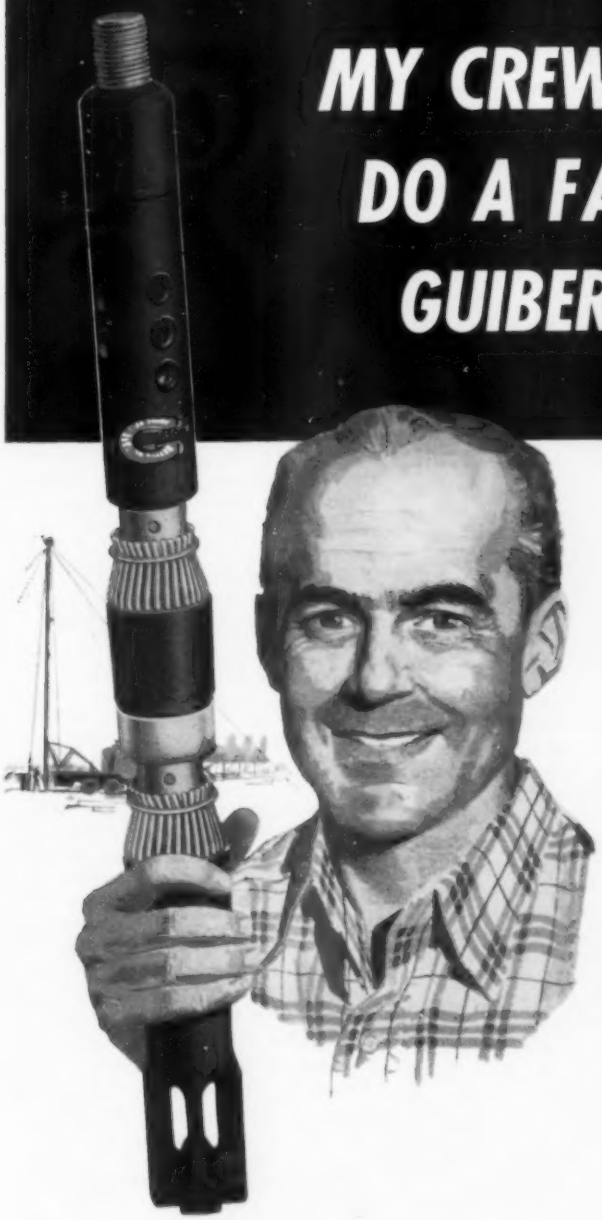
Mechanical Goods Division

United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.

MY CREWS DO A FASTER JOB with GUIBERSON SWABS



There's no substitute for a fast-falling, smooth-pulling Guiberson swab in speeding-up swabbing operations. Crews make fewer trips .. do a better clean-out job .. lift more fluid per hour. So naturally they're in and out quicker .. at the *lowest possible* swabbing cost. Match one of these cups to your swabbing job.

TYPE J .. lifts heaviest loads

TYPE L .. lifts medium or light loads

TYPE GW .. for light loads

TYPE K .. general purpose cup to 6,000 feet

SIMPLEX .. lifts fluid containing suspended sand

More than a third of a century of swab-making experience is behind each Guiberson swab and cup. No matter what type of production .. shallow or deep .. light or heavy loads .. smooth, rough or tight tubing .. you will pull more fluid with Guiberson swabs and cups. Regardless of your swabbing problem, you can meet it .. solve it .. quicker and cheaper with a Guiberson swab.

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Dear Sir:

I parlayed The Oil and Gas Journal and a $10 map into a $2-million property.

During the fall and winter of 1956, our company, Front Range Oil & Uranium Co., found itself with title to several what we still believe to be very valuable uranium properties but without sufficient capital to develop them.

The uranium "boom" was well over and we found it impossible to raise capital and, if we were to maintain our existence, it appeared necessary that we do something other than sit on our claims and hands.

I have been a subscriber to your paper for more years than I can remember and, while I always felt that I got full value, your December 10, 1956, issue really paid off.

In it was a very comprehensive article having to do with the shallow (2,000 ft.) development then under way in Knox County, Texas.

I decided then that that was where our company ought to be.

It wasn't quite as easy as that; I made a trip to the area and found that it was impossible to pick up any properties at a price that we could afford to pay. It was then that I bought the $10 map of Knox County.

I scanned it for near-expiration dates and came up with a wildcat farmout from one of the major companies.

We brought in the pool opener, the Hackathorn-Tannehill field, named for our production manager, H. A. Hackathorn, on March 1, 1957, and have since completed our tenth successful producer.

Our total potential is now approximately 1,200 bbl. per day. Well No. 11 is now drilling and we expect to have the lease fully developed with 20 wells by mid-1959, with a total value of at least $2 million.

Just thought I'd let you know.

Gregory J. Cannon
Front Range Oil & Uranium Co.
Denver

1-EE doesn't hold this record

Dear Sir:

I have been keeping up with the progress of the Phillips 1-EE University well in Pecos County, Texas, by reading The Oil and Gas Journal.

I have found the articles interesting and informative; however, your writer has made an apparent mistake in one of his statements in the September 29 issue concerning this well.

He stated: "At one point during drilling, Phillips had nearly 12,000 ft. of open hole, a world's record."

I do not know what the world's record for length of open hole during drilling is, but Coline Oil Corp. had 12,151.8 ft. of open hole in its 1 Sessums well located in Comanche County, Oklahoma.

This well was commenced April 25, 1951, and completed November 23, 1951, as a dry hole at a total depth of 14,153 ft. with 496.6 ft. of 13⅜ in. surface casing set at 510.2 ft. R.D.F. measurements. The well was drilled to 12,662 ft. before 9⅝ in. casing was set at 3,163 ft., making 12,151.8 ft. of open hole, or at least 151.8 ft. more than your article credits the Phillips 1-EE University.

Guy W. Leach
Geologist
Coline Oil Corp.
Amarillo, Tex.

Public-land policies needed

"In recent years there have been increasing appeals and pressures to restrict certain public lands to specific uses.

"Recreation groups, fish and wildlife conservation groups, and nature groups have supported different proposals which would exclude certain lands from oil, gas, and mining development—and also exclude reclamation works.

"This entire question has developed as much confusion as controversy. Some persons claim preservation of wildlife and wilderness areas cannot be accomplished where industrial activities are permitted. Industry claims that neither natural beauty or wildlife are harmed by wise development.

"It is therefore important that we develop policies which will resolve these conflicts, and permit multiple use of our public domain to the greatest possible extent."

Sen. Clinton P. Anderson (D-N. M.), in a speech to the Petroleum Industries Committee of Albuquerque, N. M.

Wages: 75% of costs?

"If you took all of the products that are made in America, put them in one huge pile, and added up the price tags on the lot, upwards of three-quarters of this total value would represent the employment costs that were incurred all along the line of production.

"The remaining quarter or less would cover not only the basic cost of all the raw materials, but would also pay for the rental of property, the interest on debt, and the dividends that pay for use of all the tools of production that were employed."

Roger B. Blough, chairman of the board, United States Steel Corp., in a speech to the Economic Club of Detroit.

Letters to They Say should be addressed to The Editor, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

CALENDAR OF EVENTS

OCTOBER

19-21 National Association of Oil Equipment Jobbers, annual convention and trade show, Hotel Adolphus, Dallas.

20-21 Instrument Society of America, national rubber and plastics instrumentation symposium, Akron, Ohio.

20-31 New York University, second seminar on retailing for petroleum executives, NYU Washington Square Center.

20-24 National Association of Corrosion Engineers, south central region, Roosevelt Hotel, New Orleans.

20-24 National Safety Council, forty-sixth National Safety Congress, Conrad Hilton Hotel, Chicago.

22-23 National Association of Corrosion Engineers, western region, corrosion control course, U. S. Grant Hotel, San Diego, Calif.

22-25 Southwestern Federation of Geological Societies, regional meeting, Mineral Wells, Tex.

22-24 Society of Automotive Engineers, national diesel engine meeting, Lord Baltimore Hotel, Baltimore.

23-24 Rocky Mountain Oil and Gas Association, annual fall meeting, Town House Motel, Omaha.

23-24 Western Petroleum Refiners Association, refining technology and industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

27-28 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

26-28 Gulf Coast Association of Geologi-

cal Societies, Driscoll Hotel, Corpus Christi, Tex.

26-31 American Institute of Electrical Engineers, general meeting, Pittsburgh.

31 Natural Gasoline Association of America, Southern regional meeting, Carlton Hotel, Tyler, Tex.

NOVEMBER

5-6 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

6-7 American Association of Petroleum Geologists, Pacific section annual meeting, Los Angeles.

6-7 Louisiana Polytechnic Institute, School of Engineering, seventh annual instrumentation conference, Ruston, La.

6-8 Geological Society of America, national convention, St. Louis.

10 Transportation Club of the Petroleum Industry, annual meeting, Bismarck Hotel, Chicago.

10-12 American Petroleum Institute, thirty-eighth annual meeting, Conrad Hilton, Palmer House, and Congress hotels, Chicago.

18 Chemical Institute of Canada, chemical economics subject division, meeting on "The Canadian Chemical Industry—Export and Growth, Sheraton-Mount Royal Hotel, Montreal.

18-20 Ninth National Conference on Standards, Hotel Roosevelt, New York.

18-20 National Conference on Air Pollution, Sheraton-Park Hotel, Washington, D. C.

19-21 Society of Petroleum Engineers of AIME, Venezuela petroleum sections, Caracas, Venezuela.

20-21 American Society of Civil Engineers, structural division and Kansas City section, conference on electronic computation, Kansas City.

21 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

30-Dec. 5 American Society of Mechanical Engineers, annual meeting, Statler and Sheraton-McAlpin hotels, New York.

DECEMBER

1-3 Interstate Oil Compact Commission, annual meeting, Kansas City.

2-4 Asphalt Institute, annual membership meeting, Shoreham Hotel, Washington.

7-10 American Institute of Chemical Engineers, annual meeting, Netherland Plaza Hotel, Cincinnati.

9-13 National Association of Corrosion Engineers, University of Illinois, biennial short course on cathodic protection.

11-12 Mid-Continent Oil and Gas Association, annual advalorem tax forum, Hilton Hotel, Fort Worth.

JANUARY

22-24 Texas Society of Professional Engineers, annual convention, Shamrock Hilton Hotel, Houston.

23 Natural Gasoline Association of America, Oklahoma regional meeting, Biltmore Hotel, Oklahoma City.

28-29 Annual Midwest Welding conference, sponsored by Armour Research Foundation of Illinois Institute of

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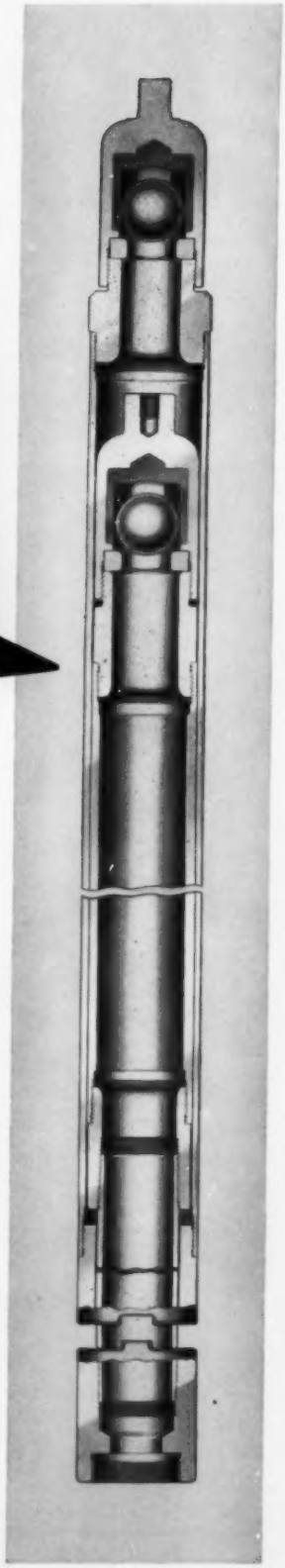

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Technology, and American Welding Society, Chicago section, Illinois Institute of Technology, Chicago.

FEBRUARY

1-6 American Society for Testing Materials, D-2 committee on petroleum products and lubricants, Sheraton-Jefferson Hotel, St. Louis.

9-11 American Association of Petroleum Geologists, Rocky Mountain section, ninth annual meeting, Civic Auditorium, Albuquerque, N. M.

15-19 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual meeting, Sir Francis Drake Hotel, San Francisco.

16-19 American Association of Petroleum Geologists, Society of Economic Paleontologists and Mineralogists, forty-fourth annual meeting, Memorial Auditorium, Dallas.

2-27 Southwestern Legal Foundation, short course on oil and gas law, Southwestern Legal Center, Dallas.

11-13 Southwestern Legal Foundation, tenth annual institute on the law of oil, gas, and taxation, Southwestern Legal Center, Dallas.

24-25 University of Oklahoma, sixth geological symposium, Norman, Okla.

27 Natural Gasoline Association of America, Permian basin regional meeting, Scharbauer Hotel, Midland, Tex.

MARCH

9-11 Midwest Gas Association, annual meeting, Hotel Fort Des Moines, Des Moines.

19-20 New England Gas Association, annual meeting, Hotel Statler, Boston.

25-27 American Petroleum Institute, Division of Production, southern district meeting, Roosevelt Hotel, New Orleans.

APRIL

2-3 Society of Petroleum Engineers of AIME, Rocky Mountain petroleum section, Casper, Wyo.

5-10 American Society of Mechanical Engineers, nuclear congress, Cleveland Auditorium, Cleveland.

8-10 American Petroleum Institute, Division of Production, eastern district meeting, Penn-Sheraton Hotel, Pittsburgh.

14 Independent Oil Men's Association of New England, annual meeting, Hotel Statler, Boston.

14-16 Southwestern Gas Measurement Short Course, University of Oklahoma, Norman.

15-17 National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland.

22-24 American Petroleum Institute, Division of Production, Mid-Continent district meeting, Herring Hotel, Amarillo, Tex.

22-24 Natural Gasoline Association of America, thirty-eighth annual convention, Baker and Adolphus Hotels, Dallas.

26-28 Texas Independent Producers and Royalty Owners Association, membership meeting, Baker Hotel, Dallas.

30-May 1 American Petroleum Institute, Division of Production, Pacific Coast district meeting, Biltmore Hotel, Los Angeles.

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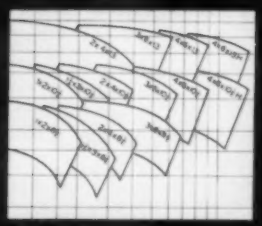

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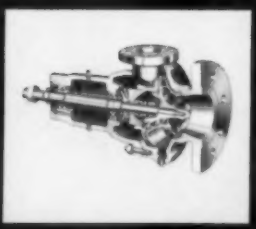

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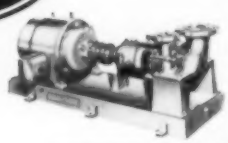

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JOURNALLY SPEAKING

"Makes Me Feel Proud"

ONCE IN A BLUE MOON an editor will get a letter from a reader that makes his job seem worth while after all, a letter that compensates for the hectic hurly-burly of the profession, a letter that offsets those calling attention to his errors of commission and omission.

Such a letter came in here the other day from the wife of an oil man whose subscription had lapsed and who, due to a misunderstanding, experienced a delay in getting reinstated. She wrote:

"My husband has received his Membership and Dues receipt, and his copy of The Oil and Gas Journal.

"Our interest in The Oil and Gas Journal goes back so far we neither one remember when, as both our fathers were oil workers. It is just like a long-lost friend returning to our home.

"I think it is wonderful for all these men to have such a wonderful trade magazine. Really makes me feel proud my husband is one among many of this great industry.

"Thanks for The Oil and Gas Journal, which is a must in our home."

Now isn't that nice? It warms the cockles of our hearts to know that our ink-slinging efforts are so appreciated. We who get out the Big Yellow Book and you who read it are so engrossed with the commercial aspects of our jobs that we seldom think of it as sort of fraternity magazine, as this lady apparently does in her reference to a subscription receipt as "Membership and Dues."

Yet the oil industry does have many aspects of a fraternity. And its public relations undoubtedly would improve if this fraternity spirit were fostered more. It makes us feel proud to know that our favorite oil publication has such a place in it.

The Rig Builders

"WHEN YOU HAVE time and space," a reader requests, "please do an article on rig builders. They seem to feel like the forgotten men, with so many jack-knives going into use."

Well, the bitter truth is that rig builders just about are forgotten men, victims of technological progress.

We asked a bright young petroleum engineer about them, and he replied:

"Rig builders? What are they? Never heard of them."

But an old timer reminisced nostalgically:

"Ah, yes, rig builders. I haven't run into a rig builder for years. Come to think about it, I haven't even heard the name for a long time.

"But rig building used to be quite a profession in the oil industry. They were specialists. That was back when derricks were all made of wooden timbers, nailed and bolted together. And it was permanent—hardly ever knocked down and reused, or even skidded to the next location if the well was dry. And of course if it was a producer the derrick was left there to handle the pumping equipment.

"When a well was going to be drilled, a lumber yard would deliver a big pile of boards and timbers to the well site. Then a crew of rig builders would move in and saw them up to the right sizes and put them together. They built the derrick, the drilling platform, boiler house, and so on, all out of lumber. When they were through the drilling crew just moved in and started to drill.

"Then steel derricks came into use, but the procedure was the same. It took specialists to erect a rig from a pile of steel beams and angle irons. An operator could save money by contracting the job to a rig builder. It was a lot safer, too, than having inexperienced men try to put up one of those rigs.

"But nowadays many rigs are completely portable, or mobile, and they practically e r e c t themselves. And others come in unitized sections that can be put together easily by the drilling crew itself.

"Rig builders? No, I'm afraid they've gone the way of the mule skinners. There may be a few still plying their trade somewhere, but I wouldn't know about them."

And that's all we can do with the request to do an article on rig builders.

—Henry D. Ralph

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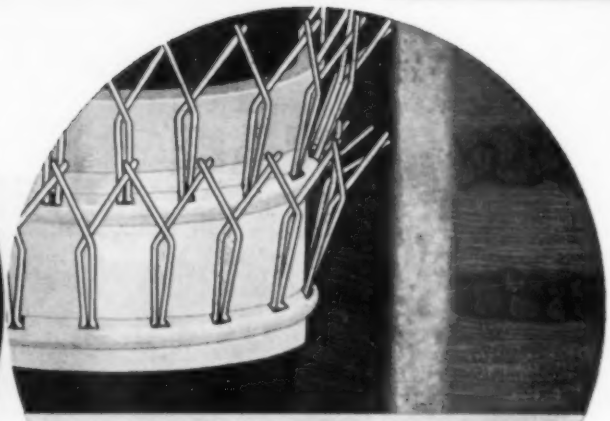
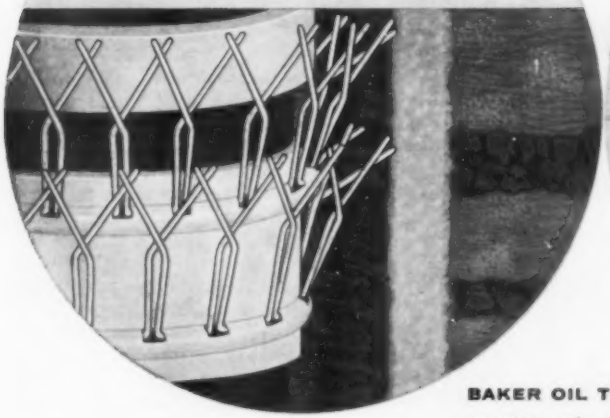


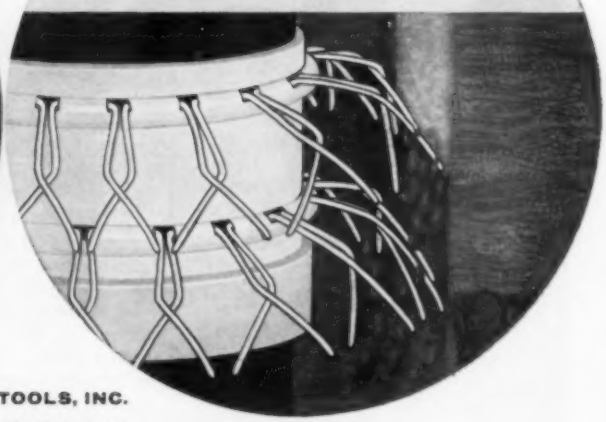
When the casing is being lowered, the scratcher wires swing freely upward and do not remove mud cake which can plug the annulus and cause dangerous pressure surge build-up.

BAKER

After reaching the area to be cemented, the hinged scratcher wires extend to contact the wall of the hole, and when the casing is reciprocated...



...scissors-like operation of the overlapped wires—over the full circumference of the well bore—effectively removes the mud cake which is circulated safely out of the hole.



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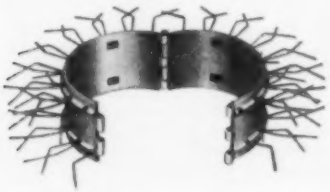

We aren't producing as well as we know how

THE oil industry is like the farmer who was offered a book that would teach him how to farm twice as well, but replied:

"I don't need no book. I ain't farmin' half as good as I know how already."

The industry doesn't need any book to tell it how to produce oil more efficiently. It hasn't applied half its scientific knowledge because it hasn't had to. Now competition of lower-cost foreign oil may force it to produce as well as it knows how.

THE MOST ENCOURAGING event of the year is the current rush to join a committee of operators exploring ways of getting more economy into domestic production. The group is spontaneous, voluntary, and unsponsored—and so new it doesn't even have a name yet.

But scores of big and small producers clamored to join while the idea was still a gleam in the eye of a few people. This is evidence that producers know that something can be done if they try.

Producers are suffering because low output per well makes their unit costs high. Output is low because the market can't use the maximum capacity of all wells. Since the market is relatively inelastic, the problem is to reduce per barrel costs of producing the present volume.

The core of the problem lies in the fact that the oil-producing industry as a whole has excessive "plant capacity." It does not have excessive proven reserves for the long-range future, but it unquestionably has current producibility far in excess of short-range needs.

The obvious answer is to produce from fewer wells. For reasons peculiar to the oil industry, inefficient wells can't simply be shut in or abandoned. However, many efficiencies could be gained by wider use of automation, joint operations, and other accepted practices.

But a great deal can be done as to wells yet to be drilled. The operators and the state conservation authorities—if they will work together toward this objective—can so influence the pattern of future drilling that few uneconomic development wells will be drilled in a proven area.

This means wider spacing, greater pooling of individual interests, more unit operations, more multiple completions, and fewer producing wells in new fields. But it will bring higher allowables per well, and hence lower unit costs per barrel produced.

NEW CONCEPTS ARE NEEDED to achieve this. Not new concepts of engineering or economics, but new concepts of regulation and of operating habits that will make use of the knowledge already in the books.

The industry can't apply its cost-cutting knowledge unless state regulations permit, encourage, and even require it. And outmoded state laws won't be modernized unless the industry takes the initiative.

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Crude-Price Changes Since April 22, 1958

Area	Cuts: Barrels per day	Cuts: Dollars per day	Cuts: Average cts. per bbl.	Increases*: Barrels per day	Increases*: Dollars per day	Increases*: Average cts. per bbl.
Texas						
N. and W. Central	21,000	1,470	7.00	14,500	1,160	8.00
East	650	163	25.00	.....	.....	....
West (sweet)	52,050	3,594	6.90	.....	.....	....
Gulf and South	202,600	22,871	11.30	16,200	2,215	13.67
Texas	276,300	28,090	10.17	30,700	3,375	10.99
Louisiana†	665,860	82,749	12.43	42,000	3,150	7.50
Oklahoma	201,000	28,140	14.00	104,500	14,625	14.00
Kansas	5,500	825	15.00	35,600	4,865	13.67
Arkansas	3,300	330	10.00	.....	.....	....
Four Corners	69,700	10,455	15.00	.....	.....	....
Other Rocky Mtn.	154,810	15,481	10.00	.....	.....	....
California	850,000	280,500	33.00	.....	.....	....
Pennsylvania Grade	34,000	17,000	50.00	.....	.....	....
Total U. S.	**2,260,470**	**463,578**	**20.51**	**212,800**	**26,015**	**12.23**

*Increases represent upward adjustments from earlier price cuts. †Includes some Mississippi and Arkansas.

Price Cuts Crimp Producers' Income

• Oil men are now getting nearly $700,000 per day less for their crude than last October when price declines set in. Latest Journal study, however, shows price cutting has become more acute since April.

A WEEK hardly passes without bringing notice of a crude-price cut to an oil producer somewhere in the United States.

The pressure currently is on the price of Oklahoma sweet. Before that California producers suffered a sharp cut on their heavy crude. Even earlier prices on the Gulf Coast and in Louisiana were soft.

Results of this chipping away at prices is that since last April cuts have:

. . . **Averaged 20.51 cents** a barrel.

. . . **Involved 2,260,470 bbl. daily** of domestic crude.

. . . **Reduced the cash income** of producers $463,000 a day.

These are the highlights of a special study made by the economics department of The Oil and Gas Journal into crude prices covering the period April 22 to October 15 this year.

Price erosion . . . When this study is put beside a similar one made last spring, it shows clearly that oil producers have lost much of the ground gained with the price increase which was made in January 1957 (OGJ, Jan. 14, 1957, p. 64).

The early study (OGJ, April 28, p. 53) showed that 29% of domestic production had suffered a price decrease since the 1957 increase. Up to that time the cuts averaged 13.10 cents a barrel on 1,944,700 bbl. daily. The cash income loss topped $250,000 daily.

But even greater price cuts have occurred since last April, as the table above shows.

In fact, taken together the two studies indicate at least 45% of domestic crude production has sustained price cuts since late in the spring of 1957.

This means that much of the benefits from the 1957 price increase have gone down the drain. That increase only averaged 25 cents a barrel. And since then nearly half of domestic production has taken price cuts ranging from 5 to 50 cents a barrel. The

total cash loss tops $700,000 daily in 12 months' time.

Where cuts hit . . . California producers have sustained the greatest price loss in the last 6 months.

Price cuts there have averaged 33 cents a barrel on 850,000 bbl. daily production. This means the cost is $280,500 daily to producers.

The largest per barrel reduction was on Pennsylvania Grade oil. The cut averaged 50 cents per barrel but involved only about 34,000 bbl. daily production.

Louisiana, Texas, and Oklahoma also took sharp losses. Louisiana cuts averaged 12.43 cents per barrel on 665,960 bbl. daily. Texas drops averaged 10.17 cents per barrel on 276,300 bbl. daily, and Oklahoma had a 14-cent cut on 201,000 bbl. daily.

Some of the increases noted in the last 6 months also are misleading.

The Oklahoma increases, for example, reflect the action of several purchasers who restored price cuts made last spring which didn't stick. Much of this gain was wiped out within the last few weeks when several major buyers again cut the price of Oklahoma sweet by 14 cents (OGJ, Oct. 6, p. 117).

Anderson-Prichard Oil Corp. made the price cut last week on 11,000 bbl. daily of Oklahoma sweet it buys. Apco's posting had the same $3.01 top and 3-cent differential below 36° gravity as used by Sunray Mid-Continent, Kerr-McGee, Champlin, and Midland Cooperative earlier.

New trends in pricing . . . The basic explanation of the continuing crude price drops is an oversupply of oil. Other factors, however, also have contributed.

Cuts revealed in the April price survey stemmed from failure of the oil industry to cut back production from the heights reached during the Suez crisis.

The prorated states in the late spring and summer, however, cut back allowed production sharply and restored a better supply-demand balance for crude.

Most of the cuts since then reflect soft products prices, attempts by refiners to price crude more nearly in line with value of products refined from the oil, and efforts to adjust the values of competitive crudes.

This struggle to revalue crudes has turned up new trends which penalize:

. . . High-gravity crude and condensate.

Nearly all purchasers now have adopted a 2-cent downward differential for crude and condensate of 45° gravity and above. This reflects the diminishing premium for natural gasoline in present-day gasoline blending.

. . . Low-gravity crude.

Some postings in Kansas and the latest Oklahoma postings are putting crude below 36° gravity on a 3-cent differential for each degree lower. The differential formerly was 2 cents per degree. Refiners report this more nearly reflects the value of the heavier crudes to them since the outlook for heavy fuel oils has dimmed.

Taken together, the two pricing trends aggravate the price cutting, and make the dollar loss to producers greater than shown in the table.

The effect . . . The cost of the rash of price cuts brought a warning from officials of Independent Petroleum Association of America.

"The decline in domestic oil finding and development programs stem primarily from one economic fact," Russell B. Brown, general counsel for IPAA, said. "The industry simply has not had the funds necessary to maintain these vital programs at sufficient levels.

"Reductions of crude-oil prices can only further aggravate this problem by reducing the funds and incentives now so badly lacking in the industry."

Brown noted that the 25-cent increase gained in 1957 was the only crude-price increase in 5½ years. He added that recent cuts on some crudes more than wiped out this gain. And during this same period, oil men have had to pay seven price increases for metal goods and five rounds of wage increases.

Joint Canadian Line Planned

. . . for gas export to U. S. Instead of two projects, PG&E and Westcoast would share 36-in. line from Alberta.

ALBERTA & Southern Gas Co., Ltd., and Westcoast Transmission Co., Ltd., have joined forces in a proposal to build one major export pipeline to the U. S. to serve both companies.

The plan was announced by J. K. Horton, president of Alberta & Southern, and Frank M. McMahon, president of Westcoast.

They propose a 36-in. line costing $40 million from the Alberta border through Crowsnest Pass to the British Columbia-Idaho border at Kingsgate, B. C. Studies indicated savings in transportation costs through British Columbia under the joint-use arrangement with a single large-diameter line rather than two separate lines of smaller diameter (OGJ, Jan. 14, 1957, p. 66, and July 22, 1957, p. 64).

Alberta & Southern, organized by Pacific Gas & Electric Co. to build a line from Alberta to San Francisco, proposes to export gas to the northern and central California markets. Westcoast would sell gas to Pacific Northwest Pipeline Corp., a subsidiary of El Paso Natural Gas Co., which supplies the western United States, including part of PG&E's demand.

Company officials forecast possible similar joint agreement for pipeline construction on the U. S. segments of planned export lines. An application for permission to go ahead with the project is being prepared and will be filed soon with the Alberta Oil and Gas Conservation Board.

Alberta Natural Gas Co., in which the two companies have equal stock interest, will own and operate the British Columbia line. Stock also will be offered to the Canadian public after export permits are obtained and plans are approved by Alberta, Canadian, and U. S. regulatory bodies.

Gas supply a problem . . . The move came just a month after the two companies were informed by the Alberta board that there was not yet enough surplus gas to meet their requirements. It was suggested that they slice their demands for gas until more reserves were proved.

Each had applied for large-diameter pipelines to carry gas to the international border. Gathering and transportation systems to the Alberta-B.C. border will be the responsibility of Alberta Gas Trunk Line Co., Ltd., under provincial law.

McMahon said the two companies would still obtain gas from their own original sources. Alberta & Southern has contracted for gas in the Foothills area of Alberta, while Westcoast has contracts in the East Calgary and Savanna Creek fields.

The gas which both companies have under contract is wet and sour. It is likely the sulfur and gas-processing plant which Westcoast planned for Coleman, Alta., will be much larger than was planned. It would process gas for both companies.

The company also expects to buiid three or four other such plants. One would be located just east of Calgary. Both companies are reported prepared to take whatever gas is available now and await new reserves.

FPC Holds Key to Aneth Shutdown

• Speedy decision on price protest could allow El Paso Natural to handle waste gas, permit U. S. to reopen wells.

THE INTERIOR Department has forced a showdown on waste of natural gas in the Aneth field in Utah's portion of the Four Corners area.

Invoking authority never before used, Interior Secretary Fred A. Seaton has ordered wells on Indian lands in the field closed down on November 10.

The shutdown will continue until provision is made to handle the natural gas produced in conjunction with Aneth's 80,000-bbl. daily oil out put.

The suspension covers only wells on Navajo and federal leased lands. These total 327 oil wells of the 357 producible in the field. Utah conservation officials, however, have asked companies operating on state school leases voluntarily to close down also. They expect the companies to comply to avoid confusion over correlative rights.

Why the move . . . The Interior Department order was taken on plea from the Navajo Tribal Council.

Navajo officials asked that flaring of gas be stopped to conserve resources and prevent waste of tribal assets. "This is vital and essential to the interests of the tribe and for the sake of future oil and gas production," the Indians said.

Waste of gas from the 327 wells on federal-controlled lands in Aneth was estimated at 64,000 M.c.f. daily by the U. S. Geological Survey. Much of the production is from wells operated by major oil companies. These include Carter, Continental, General Petroleum, Ohio, Pure, Sinclair, Shell, Superior, and Texaco.

The real aim . . . Washington sources indicated the Seaton-approved order was aimed at speeding construction of a pipeline and field-processing plant already planned for Aneth by El Paso Natural Gas Corp.

These facilities would halt most of the gas flaring by giving an outlet for the natural gas produced in connection with oil.

El Paso Natural got a temporary certificate August 1 to attach the Aneth reserves and build $14 million of the $26.1 million worth of facilities it had proposed.

Construction already has started on 63 miles of 16-in. and 13 miles of 20-in. main line to El Paso's 24-in. San Juan system. Work also is under way on 102 miles of field lines and on a 10,200-hp. compressor station.

Work on the gasoline plant and dehydration facilities has not been started.

This doesn't mean, however, that El Paso Natural can't handle the gas until these facilities are built in Aneth. The company expects to complete the pipelines by November 15, only 5 days after the field is to be shut in. Presumably it could start taking gas through the lines almost immediately and move it to the San Juan River plant for processing temporarily.

The FPC case, however, apparently will drag out beyond that date, although it has been on file with the commission since last December.

Price the issue . . . The real snag for the whole project has been the price El Paso Natural has agreed to pay for Aneth gas.

California state officials protested it was too high and the result has been lengthy FPC hearings on the matter.

El Paso agreed to pay 20 cents per M.c.f. to start, with a 1-cent escalation every 5 years. El Paso has testified that the 20-cent price for dry gas delivered at 850 psi. actually is cheaper than some of the 12-cent wet gas which it is buying at the lease.

Testimony and cross examination in the price case were completed October 10. Briefs will be filed by October 31 with replies by November 7. The examiner's decision will follow unless it is waived by FPC officials to expedite the case.

Volumes affected . . . Federal records show that 2,393,000 bbl. of oil was produced in Aneth in July.

Of this 2,138,000 bbl. came from Indian leases, 193,000 bbl. from federal leases, and 62,000 from state leases. The oil moves by pipeline to California and Texas.

Interior Department officials explained that Navajo lease provisions and operating regulations of the Geological Survey provide the authority to suspend production from Indian and federal leased lands when necessary to prevent waste. This is the first time the survey ever has invoked the authority.

Seaton asserted that suspension of production until facilities can be put into operation to collect and save the natural gas is "an essential conservation measure."

Only exceptions from the closing order will be for wells where production is necessary to protect Indian or federal lands from drainage through continued production from fee or state lands.

Pipeline Case Set

by high court. Review due in consent-decree appeal.

DIVIDEND POLICIES of shipper-owned oil pipelines will be reviewed by the U. S. Supreme Court.

The high court, on its first business day of the new term, agreed to consider Justice Department charges that three pipelines had violated the 1941 Elkins Act consent decree limiting dividends to 7%.

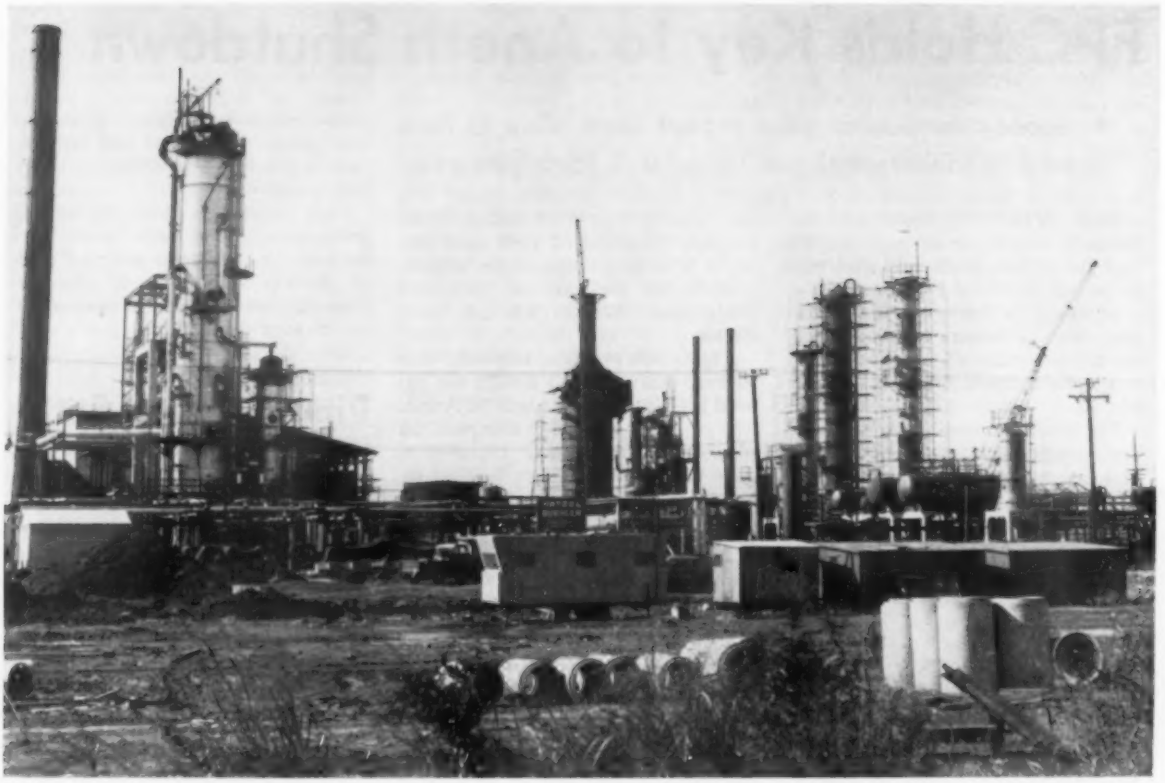
The court acted on the department's appeal from a district court's dismissal of its case against the Arapaho Pipe Line Co. But two other suits dismissed at the same time, against Tidal Pipe Line Co. and Service Pipe Line Co., also are involved (OGJ, Mar. 31, p. 55).

The Government charges the pipelines, in effect, with giving their shipper-owners illegal rebates on their shipments of oil by declaring dividends which it claims exceeded the consent decree limit. But the lower court held that the practices on which the charges were based had gone along for years without challenge and said the Government had no right to rewrite the decree now.

Other action . . . The Supreme Court refused to tinker with ratable take orders of the Texas Railroad Commission and refused to disturb a Federal Power Commission denial of a gas rate increase based on an escalation clause without the submission of cost data.

The Texas commission's order, requiring that if Permian Basin Pipe Line Co. bought gas in the Puckett-Ellenburger field it must take it ratably from all producers, was upheld by a Texas civil court.

The FPC case involved a rate increase sought by Sun Oil Co. under a 1948 contract carrying an escalation clause. The FPC held that cost data must be submitted, "at least as a starting point."



HEART of the new Hess refinery is the big crude unit at left. Tall black tower in center of the photograph and smaller one at its right are Platformer heaters. Two Unifining units and a Platformer are at right.

Refiner in a Hurry: Hess Builds Plant

• Spurred by a bonus arrangement, contractors set up a modern refinery in a matter of a few months on a New Jersey waterfront site. Expansion plans already being made by an amazing oil man who enters a new field.

WITHIN a few days Hess Transport & Trading Co. will put the first units on stream at its new modern refinery on the New Jersey waterfront near Perth Amboy.

When that happens, sometime around November 1, it will climax an amazing story of speed in erecting a complex refinery from the ground up.

Only last spring, the 100-acre plant site was flat meadow land on Arthur Kill, where most of metropolitan New York's marine terminals are located. Today the site is occupied by a maze of towers, tall heaters, and storage tanks and is interlaced with a network of intricate piping.

Behind all this activity is Leon Hess, an unobtrusive, little-known figure in the oil industry who has jumped right into the middle of the competitive East Coast refining business with practically no publicity.

The plant . . . Hess has never announced publicly what kind of units he's building at Perth Amboy or the processing scheme to be used.

All persons around the Hess organization and contractors and their personnel on the jobs were pledged not to talk. As a result, speculation has been keen in refining circles about what kind of plant this newcomer was erecting.

From several sources, The Oil and Gas Journal was able to piece together this rundown on the new plant which is rated at about 45,000 bbl. daily capacity.

Heart of the refining is the big crude unit for which Lummus Corp. has the contract.

Downstream facilities include a naphtha Unifining unit, a fuel-oil Unifining unit, and a Platformer. Contract for these, plus offsite facilities, went to Refinery Engineering Co.

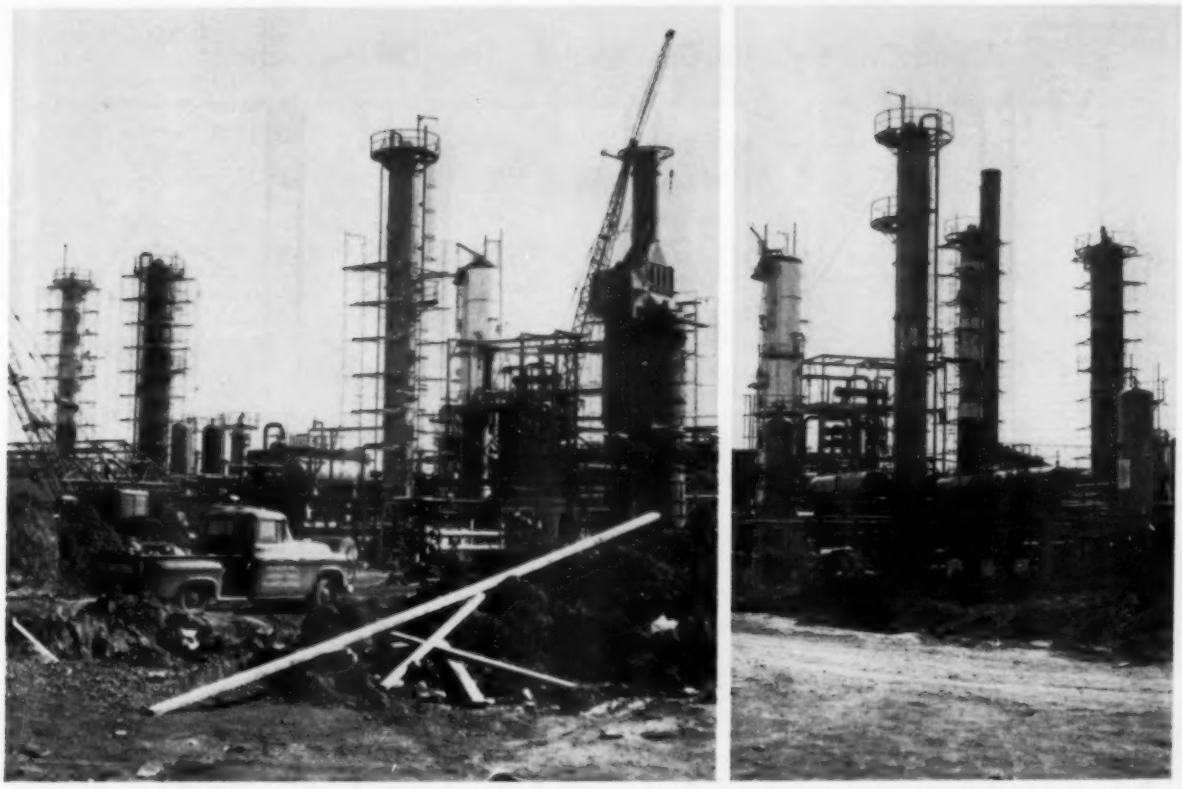
Bids already are in for a Udex unit of the latest design which will be built after the plant is on stream. This unit will put Hess into petrochemicals.

Contracts for the facilities were let on a bonus-penalty arrangement based on a December 1 completion date. The plan worked like this: For each day the contractor completed the job ahead of schedule, he received a $3,000 bonus. For every day he was late, he paid a $3,000 penalty.

Contractors stand to pick up a healthy bonus on the basis of finishing the plant nearly a month ahead of schedule. They started work in April and will wind up the major work by early November.

Key personnel already have been hired to direct the refining staff. By the November start-up date, the entire work force also will be ready.

Oil is ready . . . A million barrels of



DOWNSTREAM facilities include Unifining units and a Platformer. The view at left shows Platformer heater, reactors, stabilizer, and Unifining splitter, stabilizer, and separator. More Unifining facilities are at right.

in Jig Time

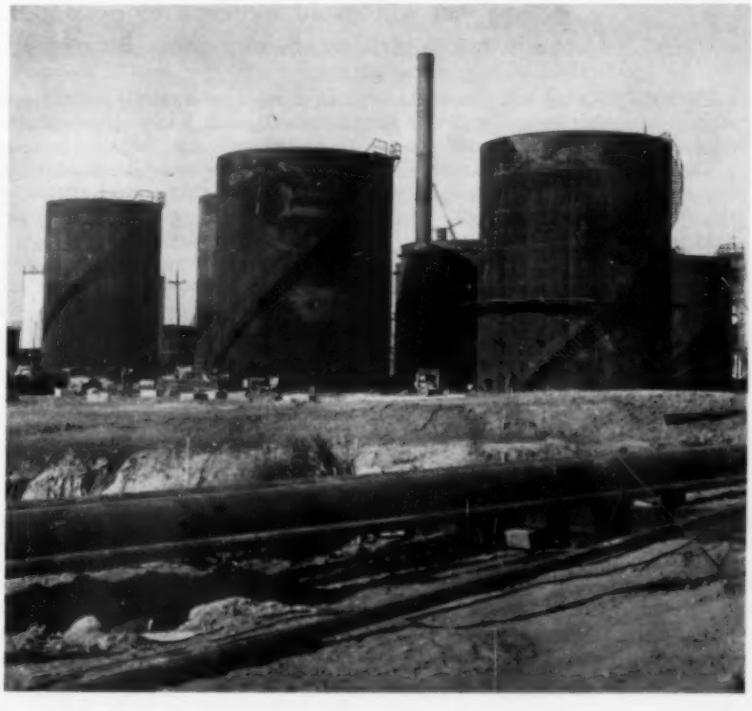
crude to be used in the refinery already is stored in nearby Hess tankage.

The Hess company has been importing foreign crude for months under a voluntary import quota. Much of this oil was moved in Hess' own tankers and stored nearby awaiting completion of the refinery.

With the refinery in operation, Hess can qualify as an importer of foreign crude under the new control program proposed recently. He can establish refining capacity and within a few months also can have a record of refinery runs. Quotas under the new import plan are established from these two factors.

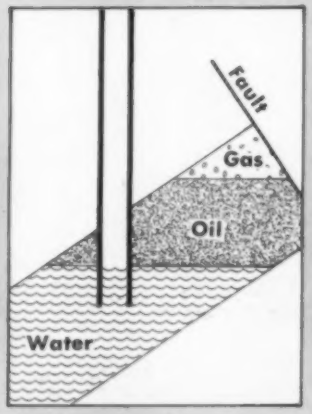
The import angle has been suggested as an explanation for Hess' reluctance to talk about his refinery operations. But persons who know Hess discount this. They explain that's the way he does business. They describe him as a quiet, keen business man who just doesn't like publicity about his business.

He enters his new refining venture after building a successful tanker transport and fuel-oil distribution business in the New York area.



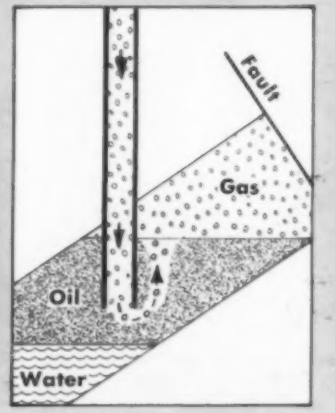
TANKAGE for products storage and rundown are provided in these smaller containers. Piping in front is products and feed lines.

Using One Hole for Gas Injection, Then Oil Production



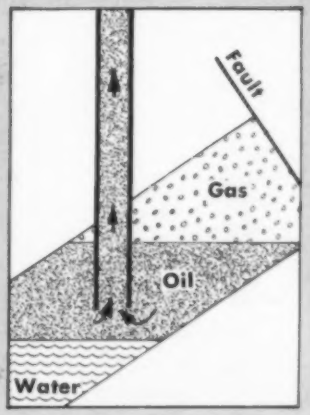
Shut in by water . . .

Currently a strong water drive has encroached upstructure as oil has been produced, watering out perforations and putting well off production.



Gas injection . . .

Injected gas will move upstructure by gravity segregation to "attic" of reservoir. The gas will build up pressure, force oil and water back down structure.



Oil production . . .

When oil is pushed back down around perforations, injection of gas is stopped. Pressure from "gas cap" above and water below enables oil flow to resume.

O&GJ

New Recovery Idea Should Cut Costs

• Pan Am will avoid expense of gas-input wells at Texas project where faults make drilling a big risk. Recovery of 500,000 bbl. is expected.

PRODUCERS are doing more these days than paying mere lip service to economy in oil-production operations.

The Texas Railroad Commission has approved use of a new oil-recovery technique for High Island field in Galveston County.

The method will be used soon by Pan American Petroleum Corp. in five small Miocene fault-block reservoirs on the complex High Island piercement-type salt dome.

Pan Am expects to recover nearly half a million barrels of oil it couldn't otherwise produce from these reservoirs. None of the reservoirs cover more than 3 acres.

The project will be carried out with an unconventional method by which Pan Am will first inject gas, then cease injection and use the same wells for oil production.

Pan Am feels it has proved the technique is sound and workable via experiments in the Camerina sands of West Hackberry field in South Louisiana.

How it works . . . The seven input-producer wells involved in the High Island program currently are off production due to water encroachment.

All the wells are completed in small reservoirs with heavy natural water drives. And each reservoir is tilted—the angles ranging between 15° and 36° off horizontal.

The injected gas, Pan Am says, will move upstructure by gravity segregation to the upper limits of the reservoirs. There, in effect, the accumulating gas will form caps and exert increasing pressure downward on the oil upstructure from the wells. Oil will be forced back downstructure to the wells until it resaturates the sand around them, meantime forcing back the invading water.

When this stage is reached, injection will be halted and oil production will start again.

Why this? . . . The reason for such a program is obvious. It saves the very considerable expense of drilling more wells for input service to the pay-zone depths of 4,600 to 6,875 ft.

Pan Am is convinced this approach will achieve the same effects as drilling conventional input wells and injecting the gas at the crests of the producing zones.

But there is added reason for Pan Am's action. Even if inputs were drilled, they might miss the pay. The formations in the vicinity of the reservoirs involved are so complexly faulted that drilling more wells would be hazardous.

Cities Service Picks Warren

J. ED WARREN, banker, government official, and prominent independent, has been named chairman of the executive committee and a director of Cities Service Co.

Warren has resigned as senior vice president of First National City Bank of New York to join Cities Service November 1.

W. Alton Jones, Cities Service chairman, said Warren "will bring new strength to our senior management policy group" responsible for directing an "extensive expansion and development program."

Warren joined Carl B. King Drilling Co. in 1934 and was president from 1943 to 1952. He also was man-

aging partner of King, Warren & Dye, Midland producing firm. He joined First National in 1953 as vice president in charge of the oil department and was named senior vice president in 1957.

He is a former president of the Independent Petroleum Association of America and the American Association of Oilwell Drilling Contractors, and a director of the American Petroleum Institute and the Mid-Continent Oil and Gas Association.

During part of 1952 and 1953 he was deputy administrator of the Petroleum Administration for Defense, and in 1956 he served as Interior Department consultant during the Suez crisis.

Gas Plant Ready

at big Pembina field. Goliad will gather 85,000 M.c.f. daily through new system.

CASINGHEAD GAS from most of Canada's huge Pembina field has begun to move through a new $21,000,000 complex of gathering lines and processing facilities.

The big gas plant, which will serve the largest producing area yet handled on this continent by a single installation, is owned and operated by Goliad Oil & Gas Co. Goliad is controlled by the Harry W. Bass interests in Dallas.

Goliad will gather and process the casinghead produced with oil from most of the field's 2,600 wells. The new system serves about 88% of the field.

The gas will be gathered through more than 300 miles of pipelines and fed to eight "satellite" compression recovery plants serving about 290 Pembina tank batteries. The satellite plants extract the raw liquids, deliver the residue gas to the pipeline purchaser, and pipe the liquids to a central fractionation plant in the field.

The central plant separates the mixed stream into propane, isobutane, normal butane, and natural gasoline. Total liquids production will run about 196,000 gal. daily from a gas throughput of about 85,000 m.c.f. daily.

Roughly 65,000 M.c.f. daily of residue gas will be sold to Northwest Utilities, Ltd., for distribution to consumers in Alberta. Liquids will be shipped by both truck and tank car. Goliad's large tank-car loading terminal on the Canadian Pacific Railroad near Breton began operating October 16.

watching WASHINGTON

Bertram F. Linz

• Inflation may force showdown in Congress

PEACETIME CONTROLS of prices and wages may be a live subject in Congress next session.

Democrats charge that the administration has encouraged inflation.

Republicans predict that the Democrats will try next year to pass New Deal control bills.

Organized labor contends that wage contracts now being made will not add to inflation.

Warnings that controls will be needed if prices get out of hand have been sounded in many quarters. Even the White House has admitted concern with the situation.

A tip on congressional sentiment may come in December, when a committee study of the price-wage situation will get under way.

• Memphis decision may come this year

THE SUPREME COURT is set to give a quick decision in the highly important Memphis case.

The court will hear argument on the case this week. It could hand down its opinion before the end of the year.

This is a billion-dollar case. At least that much pipeline expansion was scrapped or deferred because of the cloud on rate increases raised by a federal circuit court.

The lower court held that the Federal Power Commission could not accept rate increase pleas based on Section 4 of the Natural Gas Act unless all customers of a pipeline agreed to the hike in advance.

Lacking that approval, increases would have to be dealt with under the much slower procedure of Section 5. The pipeline companies argue that this would make it impossible for them ever to catch up with rising costs.

The FPC agrees with the pipelines and joined in the appeal. But it has promised that if the decision is affirmed it will find a way to speed up action on rate increases.

• Railroads and water carriers square off

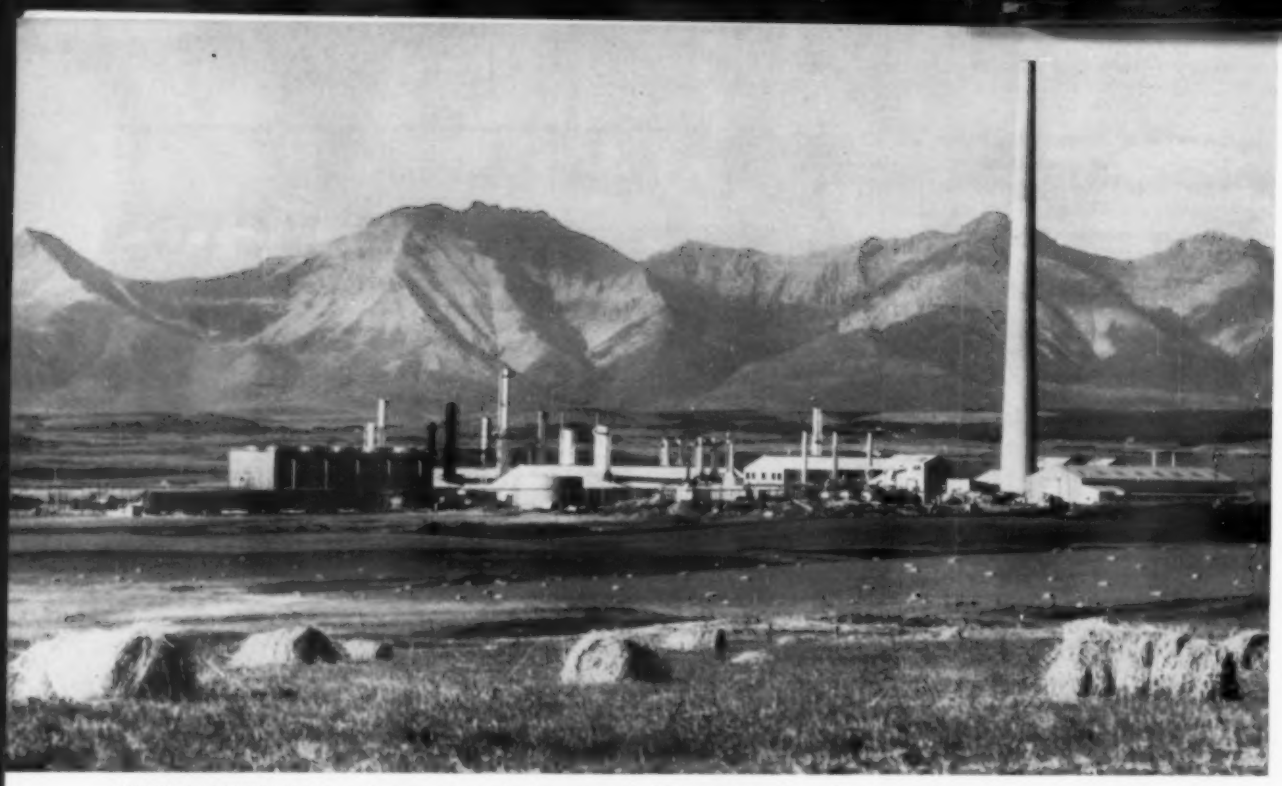
INLAND WATER CARRIERS are looking for help from the coastwise and Great Lakes lines in their fight against the railroads.

The rail lines this year were given some, but not all, of the relief they sought from Congress. The barge and towing interests expect them to go back next year for more.

The big aim of the rails is to have user charges put on the waterways and to get permission themselves to engage in water, highway, and air transportation.

Railroad interests admit they want more freedom, but just to protect their business. The water and road carriers have advantages of federal subsidies which are denied the rails, they point out. And if the railroads can widen their field they can give more rounded service, they say.

A big and growing volume of traffic moves by road or water. Take oil, for instance: Close to 300 million tons a year of crude and products moves by water. About 235 million tons goes over the roads. But the railroads carry only about 41 million tons. That is something to fight for.



PINCHER CREEK'S field and processing plant represents 11 year's work and an investment of more than $35 million. The field will start feeding gas to Trans-Canada pipeline November 1.

British American Takes Two Big Steps

- The company's first West Coast refinery and an expanded gas-processing plant in Alberta represent the biggest building program in BA's history.

BRITISH AMERICAN Oil Co. is looking to the future in western Canada.

This was obvious last week as company officials dedicated these two plants. The plants, both designed for future expansions, reflect the company's intentions to bolster its participation in the Canadian industry.

Pincher Creek is a new string in BA's bow. While no stranger to field processing, the company has in this huge plant not only a major new diversion in natural gas, but also a ground-floor opportunity in western Canada for petrochemicals based on LPG, condensate, and sulfur. In refining, Port Moody culminates BA's long-range aim of becoming a nationwide operator.

PINCHER CREEK

Pincher Creek was officially tied into the vast Trans-Canada pipeline last Wednesday as Alberta's premier, E. C. Manning, valved the first flow from the 2-trillion-cubic-foot reserve.

At the ceremony dedicating BA's $25-million processing plant, the company again voiced its long stand on the need for economic outlets for natural gas from Canada's western provinces.

HOW PINCHER CREEK GAS BREAKS DOWN

	Per cent
Hydrogen sulfide	10.78
Carbon dioxide	6.16
Nitrogen	0.40
Methane	74.14
Ethane	3.27
Propane	1.21
Butanes	0.83
Iso-pentane	0.36
n-Pentane	0.21
Hexanes plus	2.64

President E. D. Brockett summed up BA's position this way: "While we were pleased at the Alberta government's declaration recently of a disposable surplus of natural gas, nevertheless, we were surprised and disappointed that the conservation boards did not find disposable reserves in the volumes that we and other companies made evident at the Borden Commission hearings."

Brockett intimated this position does not take into consideration some recent gas discoveries, notably the BA-Shell D-3 well at Berland River, which has been called the world's biggest gas well (OGJ, Sept. 15, p. 108).

"We feel that a recasting of Alberta reserve figures is justified. We understand that supplementary hearings will shortly be held, and it is sincerely hoped that the province will acknowledge that there are sufficient reserves to warrant export in the fullest economic measure," Brockett said.

A new day is dawning for natural gas, he added. And Pincher Creek is a sign of things to come. Brockett said natural gas has contributed only 3.4% of the total realized from hydrocarbon production in Canada in the last 10 years. If markets are made available, BA feels that over 100 trillion cubic feet of gas can be discovered in western Canada in the next quarter of a century.

Pincher Creek gas is very sour, containing over 10% of hydrogen sulfide. Three conversion units, capable of recovering 675 tons of elemental sulfur every operating day, will make this the world's largest plant of its type, by a wide margin. Current operations are at the 435-ton level.

The makings of a substantial new

PORT MOODY, British American's first West Coast refinery, completes the company's coast-to-coast operations of six plants with 162,500 bbl. capacity.

in Western Canada

petrochemical center are seen in the other byproducts of this operation 3,950 bbl. of stabilized condensate, 13,700 gal. of propane, and 20,280 gal. of butanes.

But the main business of this newly expanded project is to process and deliver 100 million cubic feet of sweet gas to Trans-Canada pipeline. Pincher Creek is the greatest single source of gas for Canada's historic step toward self-sufficiency in fuels.

Since 1955, condensate output has been shipped to BA's Calgary refinery for motor fuel blending. Sulfur goes to a nitro-chemical plant at Medicine Hat and to pulp and paper mills in British Columbia. LPG finds a ready market for heat and power in the area.

Currently, the Pincher Creek plant draws from 10 producing wells. When throughput is doubled, 15 more wells will be required. Wet gas and field-separated condensate are moved to the plant in separate systems.

More building on tap . . . British American is only midway in its expansion plans at Pincher Creek.

Stage I, built in 1956, was essentially a cycling plant. Since no gas outlet existed until now, the original plant helped realize some return on investment by processing 60 million cubic feet of gas per day for condensate and sulfur removal, and returning the residue gas to the reservoir.

Stage II, just completed, doubled gas throughput, added propane and butane recovery and tied the field into the world's longest pipeline terminating in Montreal.

Ultimately, this plant will again be doubled in capacity. In basic design and layout prime contractor Ralph M. Parsons Co. of Canada has provided for future growth to handle 240 million cubic feet per day. This Stage III, doubling of output across the board, will rank Pincher Creek among the world's largest field processing plants.

PORT MOODY

British American's grass-roots Port Moody refinery is not the largest in British Columbia. But its potential for fuel product quality could scarcely be matched in any plant in the world today.

As presently designed it is years ahead of the industry average in relative capacity of the downstream processes needed to make high performance gasolines, jet fuels, burning oils and diesel and tractor fuels.

Much of BA's edge on gasoline octane will hinge on a 1,050-bbl. per day sulfuric acid alkylation unit. For a 20,000-bbl. refinery this is a lot of alkylation. But this clean-burning super high octane blend stock is going to be much more in demand as compression ratios rise. BA is ready for any foreseeable octane rise.

It is significant that Port Moody has no polymerization. In planning the process structure, BA and prime contractor Canadian Kellogg Co., Ltd., decided to convert all cat-cracked propylene and butylenes to alkylate. Initially, the plant will make about 390 bbl. of butylenes and 190 bbl. of propylene per day. When a visbreaker is added in the future, there will be more.

Isobutane deficiency is made up by fortifying crude charge with 600 bbl. per day. This makeup is enough to alkylate all C_3 and C_4 and some C_5 olefins in the Kellogg Cascade reactor. An effluent treater removes the last trace of entrained acidic material from the finished aviation-grade product.

Another first for BA is the hydrogen treating or hydrodesulfurization of distillate stocks. Alberta crude delivered by Trans Mountain is high in sulfur. A 4,000-bbl. unit using cobalt molybdate catalyst treats heating oil, diesel fuel, stove oil, and other distillate blends in a blocked-out operation. Nitrogen compounds, trace metals and unstable unsaturates are removed or converted, and original sulfur is reduced 75%. This is the first operation of its type in British Columbia.

Workhorse of the refinery is an Orthoflow "B" fluid catalytic cracking unit. Its rated capacity is 9,000 bbl. per day, but it can handle up to

14,000 bbl. total reactor feed, including recycle.

Its flexibility is reflected in the four alternate operations it is designed to perform:

Case	Fresh gas oil feed b.p.d.	Per cent conversion	Reactor temp. °F	TPR
I	9,000	62.5	900	1.50
II	7,000	55.0	900	1.10
III	4,000	71.0	900	1.60
IV	7,000	60.0	875	2.00

In Case II the gas oil feed is augmented with outside gas and liquid streams from the naphtha and cycle-oil desulfurizers, the catalytic reformer, and the visbreaker, when it is added. Hydrogen-rich gas is included in this mixed fresh feed. In Case IV the high throughput ratio (TPR) calls for recycling catalytic gas oil in volumes equal to fresh feed. This operation minimizes heavy cycle-oil output.

The 4,000-bbl. Catforming unit is packaged with a naphtha desulfurizer. Charging up to 7,200 bbl. of 380° F. end point straightrun naphtha, this hydrogen-treating unit does three jobs. It supplies reformer feed, light naphtha for blending or further conversion, and finished jet fuel.

BA's future plans call for isomerization when gasoline octanes require this further step. The desulfurizer has built-in provision for later addition of a stripper for isomerizer feed. It will also permit adding a rerun tower to produce turpolene from a fraction of the reformer feed.

Reformer output includes a 95 Research octane reformate, a mixed C_3C_4 fraction for alkylation, and hydrogen-rich gas. Excess of the latter, not required in the two hydrogen-treating units, goes to the fluid cat cracking recovery system.

Design of the reformer will permit later addition of an extra reactor to be substituted during on-stream regeneration. Reforming can range from 60 to 100% of rated capacity.

Auxiliary facilities have been given ample attention.

The refinery is the first in Canada to incorporate completely automatic gaging throughout. Another Canadian first is the complete, all-electronic instrument system on process units. Higher over-all efficiency is obtained from a 85,000-lb. per hour carbon-monoxide boiler on the fluid catalytic cracking unit. Automatic in-the-line blending is used in compounding all fuel products.

The 20,000-bbl. refinery is costing BA $25,500,000. While it provides integration of processes, it retains sufficient flexibility to permit bringing individual units down without disrupting over-all operations.

NGAA Committee Puts K-Data on Punch Cards

. . . for fast computation on IBM machines. New system means a shortcut to problems involving 12 compounds.

GAS PROCESSORS and refiners can now use punched cards instead of the conventional charts and tables to solve complex problems in hydrocarbon phase equilibrium.

The Natural Gasoline Association of America will sell the card sets for use in electronic machine computations.

Information was taken from the 130 K charts in the second edition of the NGAA Equilibrium Ratio Data Book of 1957.

These charts contain data for 12 compounds (methane through decane) over a range of convergence pressures from 600 to 20,000 psia. and a temperature range from 500° F. to as low as −260° F.

The cards come in two batches, the "point" set and the "coefficient" set. On special request, data will be transferred to magnetic tape.

The point set consists of 17,300 cards. Each card has four punched points, all identified by component, convergence pressure, temperature, and pressure.

The coefficient set has 432 cards with seven coefficients per card. These were derived through curve fitting and power series equations involving logarithms of pressure and temperature. They present about 28 numerical coefficients per page for all the charts in the data book.

This set also includes tables of the coefficients; flow sheet for machine solution of the equations; suggestions for simpler methods in less complex problems; and a sample calculation.

The work was done by a subcommittee of the NGAA technical committee (photo). Most calculations were done at the University of Michigan by Brymer Williams and Robert Norman.

*Left to right: W. F. Lowe, NGAA secretary-treasurer; Wayne C. Edmister, Oklahoma State University; R. H. Jacoby, Pan American, Tulsa; Byron B. Woertz, Pure Oil, Crystal Lake, Ill., subcommittee chairman; C. E. Webber, Sun, Philadelphia, technical committee chairman; Ovid Baker, Magnolia, Dallas; Earl Gray, representing Karl H. Hachmuth, Phillips, Bartlesville; and Robert Norman, University of Michigan. Not shown are E. A. Gromatzky, Texas Co., New Orleans; and Herbert Stone, Humble, Houston.

Fueling Military a Job

. . . even during minor operations. But armed forces are high on oil industry's ability to supply fuel demands.

SENDING U. S. forces into Lebanon wasn't a major military operation, but it showed that fueling even a minor operation today can be a major problem.

Here's what happened:

. . . **Some 8,000,000 bbl.** of fuel were bought for the area, 6,000,000 bbl. for the Navy alone.

. . . **Military Sea Transport** Service moved 13,000,000 bbl. of oil in July, its biggest month on record.

. . . **The sudden surge in avgas** demand was more than the industry could immediately supply.

These facts were mentioned by Rear Adm. O. P. Lattu, executive director, MPSA, at the Quartermaster Association convention in Philadelphia. The avgas problem is sufficiently serious, he said, that it may be referred to the National Petroleum Council.

Admiral Lattu was one of a dozen speakers on a program during which the military and oil took a critical look at each other. Both, apparently, liked what they saw.

Oil liked the prospective military fuel requirements, which call for almost entirely hydrocarbon fuels for the next 10 years at least (OGJ, Oct. 6, p. 103).

Col. C. B. Tyler, Jr., chief, POL Division, estimates that not more than two-tenths of 1% of the military expenditures for fuel will go for chemical propellants by 1960. Both JP-4 and 115/145 avgas will long be needed. He mentioned that the C-47, counterpart of the DC-3, is not scheduled for discard before 1970, when it will be 37 years old.

The military spoke highly of oil's ability to meet its demands in quality, quantity, and on time.

New products . . . Supplying troops in the field has always been a major problem. The military described some of the new devices in use or being contemplated for distributing petroleum products.

Col. J. R. Maedler, chief, petroleum division, Quartermaster General, listed these new ideas:

. . . **Collapsible 500-gal. containers** which can be dropped by chute or transported by helicopter. A 5,000-gal. container can be used for converting an ordinary truck to a tanker, and a collapsible 10,000-bbl. container can be used for storage.

. . . **Vehicles,** such as the huge Goer, a four-wheel drive, amphibious tanker capable of fueling five vehicles simultaneously.

. . . **A grid-type system** of pipelines that would make it possible to shunt petroleum deliveries around danger areas.

. . . **An automatic welding system** for pipeline construction. He showed pictures of a prototype model that has been developed.

Oil is ready . . . Speaking for oil, Ray Winkler, Standard Oil Co. (N. J.), said the industry is better able to meet an emergency demand now than it was before Suez. He credited it to existing excess capacity both in production and transportation.

Winkler predicted that current free-world demand of 16,600,000 bbl. per day would reach 22,730,000 bbl. per day by 1965. The industry will be able to meet it, he said, but to meet an emergency it must be assured that it can work together without fear of prosecution.

Errol J. Gay, consulting engineer, predicted that it would be a long time before gasoline and compression ignition engines are replaced. The gas turbine represents no great breakthrough in fuel efficiency and is yet to be perfected. The compound engine, or free piston engine plus gas turbine, promises some improvement in fuel efficiency but still has too little performance information to prove its value.

Dr. B. M. Sturgis, director, petroleum laboratory, of Du Pont, reviewed the prospects for new fuels. Many offer greater energy per pound than petroleum fuels, but their potential use is severely limited because of cost, transportation problems, density, and lack of efficient engines.

He cited hydrogen, with 51,000 B.t.u. per pound against 18,800 B.t.u. for gasoline, as a preferred possibility. However, he said, a DC-7 would have to be 17 times its present size to operate on hydrogen. He said that greater energy could be obtained from hydrocarbon fuels, up to 110,000 to 120,000 B.t.u. per pound, but only at a prohibitive cost.

the JOURNAL *said . . . . . .*

50 *Years ago*

October 20, 1908

The old time crowds of oil men are again assembling in the lobby of the Robinson hotel (Tulsa) every evening just after supper. While prices of oil have not improved there is a decidedly more buoyant feeling.

The Gulf Pipe Line Company has closed a deal for the leases of the St. Louis and Gulf Oil Companies in the Glenn field. The transfer includes more than a dozen 55,000 barrel steel tanks. The oil in these tanks was purchased by the Gulf Pipe Line Company some time ago. Both the Gulf and St. Louis Companies were owned by St. Louis people, and the operations of the companies were very extensive and successful.

25 *Years ago*

October 19, 1933

Harold L. Ickes, Secretary of the Interior, as administrator under the petroleum code, today issued an order fixing minimum prices for petroleum and its principal products, effective as of December 1, 1933. The basic minimum price for Mid-Continent crude petroleum, 36° gravity, is fixed at $1.11.

Tide Water Oil Co. and Texas Seaboard Oil Co.'s No. 1 Monnig (Lone Lake Plantation), Anderson County test, has proved conclusively that another oil field has been uncovered in East Texas, this time in the southern part of the district and located miles from any other field.

10 *Years ago*

October 21, 1948

With three wells completed as good commercial producers, the combination of Phillips Petroleum Co., Stanolind Oil & Gas Co., Kerr-McGee Oil Industries, Inc., has under development the first oil field in the world out of sight of land.

The field is located on a 20,000-acre lease block lying in Louisiana coastal waters some 85 miles southwest of New Orleans. Specifically it is 10 miles offshore from Point au Fer, Terrebonne Parish.

A total of 490 rigs, most of which are rotaries, are currently operating in 44 foreign countries, according to a comprehensive survey, which omits Russia and the Russian-dominated Baltic countries. Of the 490 rigs now operating, 333 are in Latin America.

Important Changes Due in Import Plan

• There's agreement within the industry on the basic approach to imports control, but there's little unity on details of the proposed order. Clues to the probable revisions are found in 135 "comments" submitted to Carson.

THE NEW import-control program is due to be revamped before it goes into effect January 1.

A number of changes are being studied by Capt. M. V. Carson, Jr., program administrator. Some were suggested in the 135 letters received during the 30-day "comment period" following announcement of the plan. Others are the result of further analysis of it by Carson and his aides.

The letters to Washington indicate that there is little or no objection to the basic idea underlying the new program. But the big importers, small importers, refiners now holding quotas, and those who want them all have their own ideas for changes.

It will be up to the cabinet fuels committee to decide what revisions shall be made. But several large importers have demanded changes as the price of their cooperation. Others have warned that they may find it impossible to cooperate unless persistent violators are curbed.

Problems for decision . . . Here are some of the points that will have to be dealt with by the committe:

. . . Whether quotas shall be assigned as outlined in the plan or be put on an historical basis.

The latter is sought by established importers who have put large sums into foreign development. But they also press another point:

. . . Whether quotas should be limited to importers who will process the foreign oil in their own refineries.

That is by far the most important decision the committee will have to make.

. . . The timing of the program. Many small refiners object to the long transition period now proposed. They want the program to go into effect 100% immediately.

. . . Whether finished products should be covered by the quota system. Demand for this is coming from domestic producers and refiners and even some importers.

. . . Retention of the proposal to exempt asphaltic crudes from inclusion in quotas.

It is expected that this exemption will be deleted. It is argued there is no need at the moment for asphalt that cannot be produced as required. And if the highway program suddenly develops the need, an exemption can be provided later.

. . . Inclusion of District 5 under the program immediately.

It is argued that the West Coast is due to be covered sooner or later. And there are indications that the area's imports are about to break through the quota ceiling.

. . . Allocation of quotas by districts and then by refiners within districts.

The idea here is to spread imports in such a way as to make it impossible for East Coast refiners to use all their imported crude in that area, opening up a market for domestic oil.

. . . Enforcement of compliance with quotas. This is now the weakest point in the import control program.

What the letters say . . . Major changes sought in the program are indicated in a cross-section of letters filed with Carson:

. . . Tidewater Oil Co., among the hardest hit by the revised program, charges it would mean "economic confiscation" of its eastern seaboard refinery, penalizing the company more than $16,000,000 per year.

Tidewater planned to import 84,000 bbl. of crude per day. Its present quota is 29,500 bbl. daily which would be further cut to about 12,000 bbl. under the new program.

. . . Atlantic Refining Co. offers concrete suggestions to favor historical importers.

Under its proposal, 20% of the over-all quota would be allocated among all refineries requesting foreign crude for processing. The remaining 80% would be allocated on the basis of historical use over the previous 3 years.

Atlantic also proposes that quotas be given to individual refineries rather than to companies, with a ban on transfer of quotas, and urges that quotas be based on capacity rather than runs.

. . . Sinclair Refining Co. recommends that some weight be given to past performance of individual companies, but it contends that no workable program "can be, or should be, frozen on an historical basis."

T. B. Kimball, Sinclair president, suggests a "reasonable floor" limiting loss of historical quota by an established importer and a "reasonable ceiling" limiting quota gains by new importers.

Sinclair also recommends that restrictions be extended to all importers, including the Government, and to cover all crude and petroleum products.

Other changes suggested by Sinclair:

That quotas be given only to those who own and use their own refineries for the processing of imported oil and only to those who receive and

PIPELINE BRIEFS . . .

Main-line construction on a 130-mile crude line from Swan Hills southeast to Edmonton was completed last week. Mannix Co., Ltd., finished its section, 46 miles of 8 and 10-in. between Swan Hills and Fort Assiniboine, for Federated Pipe Lines, an affiliate of Home Oil. Banister Helm, Ltd., laid the southern portion of the 20,000-bbl. daily line, which is now being tested.

Contract for a 95-mile, 12-in. line for Coastal Transmission was let last week to O. R. Burden Construction Corp., Tulsa. Burden will start this month on the project between McAllen and Robstown, Tex., near Corpus Christi. Coastal last month awarded contracts to Oklahoma Contracting Co. for 277 miles of 20 and 24-in. on its main line to Baton Rouge, where it connects with Houston Texas Gas & Oil Co.'s line under construction to Florida.

Permission to build 61 miles of 16-in. supply line and 11 miles of field lines has been granted by FPC for Permian Basin Pipeline. Permian will spend $3,681,600 on the facilities to take gas from Emperor field, Winkler County, Texas, produced by Sun Oil Co., Phillips Petroleum Co., and Tidewater Oil Co.

Approval for a 128-mile, 34-in. natural-gas line to connect with Transwestern Pipeline's proposed West Texas-California line at the Arizona

distribute such imports from their own plant facilities.

That a company not be required to "sign a blank check" for future compliance in order to qualify for Government contracts.

... **Eastern** States Petroleum & Chemical Corp. objects to the new program because it only limits importation of crude and unfinished products and because the Government continues to buy and import large volumes of foreign oil.

Eastern States' quota would be reduced from the present 15,800 bbl. daily to 6,300 by 1960 under the Carson program. Its August and September imports were some 40,000 bbl. in excess of its quota, Carson reported.

... **Texas Independent** Producers and Royalty Owners Association favors removal of "economic advantages" from foreign production by a "tariff or competitive bidding."

TIPRO also wants the program broadened to include all products on a nationwide basis. It urges a cut in total imports, an absolute ceiling, no special exemptions, and stiff enforcement of the program.

... **The Independent Petroleum** Association of America stands firm for a limit on oil imports not exceeding their 1954 relationship. The IPAA also favors a nationwide program covering both crude and products.

... **The National Coal** Association remains opposed to the new program, charging that it will not reduce total oil imports nor limit shipments of residual displacing coal in eastern seaboard markets. The coal people, like many oil interests, want the program to cover both crude and products.

"Worst" Well Fire Hits CATC

. . . as explosion on offshore platform results in seven wild wells, turns loose several producing formations.

THE OIL INDUSTRY now knows what happens when a multiwell offshore platform blows up in flames.

Nightmares became reality last week when a CATC seven-well platform off Louisiana caught fire and dealt the industry what is probably the worst disaster of its kind in history.

CATC said an explosion, rather than a blowout, probably caused the fire.

When the blast occurred, crews were completing a new producer in four separate zones. It would have been the world's second well completed with four separate tubing strings. The first is on a nearby CATC platform (OGJ, June 30, p. 48).

Continental Oil Co., operator for the CATC group, said that production was being taken from 12 strings at the time of the blast. Together, the seven wells account for about 20 completions.

The fire occurred on the 45-E West Delta 30 platform, 25 miles southeast of Grand Isle off Jefferson and Plaquemines Parishes. The wells on the platform had been producing 1,530 bbl. of oil daily and 950,000 cu. ft. of gas.

Production was from zones reaching from 6,100 ft. to 10,300 ft. in depth. Surface pressures were 500 to 2,500 psi. The water is 50 ft. deep and the platform decks 50 ft. above the water surface.

The seven wells were spaced 7½ ft. apart in two rows. The two rows—with four wells in one and three in the other—were 10 ft. apart.

It was believed that all seven wells were burning at one time, but shortly after the fire the operators were unable to say specifically how the explosion occurred and how the fire spread from one well to the next.

Inasmuch as a quadruple completion was under way at the time, it was presumed that this operation may have had something to do with the explosion. Test tanks had been set up.

"Any number of things could have happened," one official said.

The 45-E platform is part of a gathering system operated by CATC, Humble, and Shell.

CATC called in Red Adair, of the Myron Kinley fire-fighting organization, to assist in controlling the blaze.

The day after the fire started late last Wednesday at least one man was dead and seven missing among the 29 men on the platform. Most of the survivors escaped by jumping 50 ft. into Gulf of Mexico waters.

T. P. Butler of Liberty, Miss., a driller, was the first man listed as dead. E. C. Swenson, Algiers, La., tool pusher, was critically burned and suffered from concussion and water in his lungs.

The flames were fed by both oil and gas from the well and shot more than 100 ft. into the air. The rig on the platform was destroyed.

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border has been granted Pacific Lighting by the California Public Utilities Commission. The new line, Pacific Lighting's fourth from the Arizona-California border to metropolitan Los Angeles, will be used to take delivery of 300,000 cu. ft. of gas from Transwestern, whose application is pending before FPC.

A 21½-mile, 4-in. LPG line is being laid by Magnolia Pipe Line Co. from Beaumont to Orange, Tex. Panama, Inc., the contractor, expects to complete December 1. The company's own crews are installing 5,000-hp. each at Grapeland, Groveton, and Bragg, Tex., stations on its crude system. The station work is to be finished February 1.

New gathering lines will replace truck transportation soon in several southwestern Kansas fields served by Jayhawk Pipeline.

Jayhawk has contracted an 83-mile, 6-in. feeder line from Meade station to the Interstate pool to R. H. Fulton & Co., Lubbock. Fulton built the 242-mile, 10 and 12-in. main line from Meade to Wichita. A second feeder line, 50 miles of 6-in. from Meade to Pleasant Prairie, has been contracted to E.C.O. Construction Co. The Interstate line will be completed November 30 and the Pleasant Prairie line December 15.

Also for Pipeliners . . .

IN THE NEWS: Westcoast Transmission and PG&E plan a joint Canadian pipeline to export Alberta gas into the United States (p. 48) . . . FPC decision on gas price case is key to how long Aneth wells will be shut down (p. 49) . . . Supreme Court will review consent-decree case (p. 49) . . . FPC staff recommendations may delay Midwestern case (p. 62).

A complete list of pipeline construction projects appears in the last issue of each month. New projects are reported weekly in Pipeline Briefs.

PLUS THESE TECHNICAL REPORTS: Combustion-air conditioning for pipeline engines (p. 84) . . . Uprate flanges with an O-ring seal (p. 111).

Venezuelan Oil Domestic

. . . and rates preferential treatment, embassy official says at SEG meeting. Increase of 9,000,000 bbl. daily forecast for Free World demand in next 10 years.

VENEZUELAN CRUDE is hemispherical and should not be considered foreign oil by the U. S. Canadian oil is also a domestic oil of the Western Hemisphere.

That's the opinion Dr. Eduardo A. Acosta, minister counselor for petroleum affairs of the Venezuelan embassy, expressed at the twenty-eighth international meeting of the Society of Exploration Geophysicists in San Antonio last week.

Dr. Acosta's statements carried official weight. He pointed out he was speaking in behalf of Dr. Carlos Perez de la Cova, Minister of Mines and Hydrocarbons in Venezuela.

He said Venezuelan oil is domestic both from the standpoint of geography and philosophy.

In calling for preferential treatment, Dr. Acosta said, "We . . . demand equal thoughtfulness and a basic continental philosophy of unity for our oil industry, one that would acknowledge its importance and respect its position of identification with the cause of democracy."

He pointed to the role played by Venezuela in helping supply Free World countries with oil during several crises, such as World War II, the Korean conflict, and blocking of the Suez Canal.

Dr. Eduardo A. Acosta
. . . Venezuelan oil is domestic oil.

Cites wildcat figures . . . Dr. Acosta pointed out how Venezuela is a more successful oil hunting ground than the U. S. by comparing the ratio of new proved reserves for each successful wildcat completed in Venezuela and the U. S.

From 1950 to 1957, the ratio in Venezuela increased from 1,800,000 bbl. of proved reserves for each successful wildcat to about 12,000,000 bbl. for each completed wildcat. The ratio in Canada also is increasing.

But the ratio for the U. S. is lower than Venezuela and is "showing a tendency to stabilize," Dr. Acosta said. He cited the U. S. figures as 1,540,000 bbl. per completed wildcat in 1950; 2,000,000 bbl. in 1954; and 2,000,000 bbl. again for 1957.

Dr. Acosta added, "Venezuela is doing its best to keep up with its obligations in the hemisphere, with due regard to the availability of supplies for the hemisphere's needs, as well as for the needs of the countries of the Free World. We know that markets in the hemisphere and other places do need the assurance of dependable Venezuelan supplies."

Needs to grow . . . The big increase in Free World petroleum demand was predicted at the meeting by Fred W. Bartlett, chairman of the board of Socony Mobil Oil Co., Inc.

Because of the increase of 9,000,000 bbl. a day between now and 1968, Bartlett said the United States is certain to need, in increasing amounts, the oil that American oil companies have gone abroad to find. Foreign oil should not be excluded, he said, nor should it be imported without regard for the health of the domestic industry.

INDUSTRY BRIEFS . . .

The first well on the 25,000-acre ranch of former Vice President John Nance Garner in Webb County, Texas, will be drilled by Pan American Petroleum Corp. The 1 Garner Ranch is in the west-central part of the ranch in the S. A. Walcott Survey, A-1948. Operator hopes to hit the Edwards reef at 10,000 ft. Nearest production is 15 miles northeast in Stuart City field.

Pan Am holds leases on the entire Garner Ranch and several thousand more acres along the Edwards reef line, both north and south of the ranch.

Merger plans of Signal Oil & Gas Co. and Hancock Oil Co. will be voted on by stockholders of both companies at special meetings to be held in Los Angeles and Long Beach, December 4. Directors of both companies have approved the share-for-share merger.

Pressure maintenance in part of the Pembina-Cardium pool is expected to be approved by the Alberta Oil and Gas Conservation Board. The program is proposed by Consolidated Mic Mac Oils, Ltd. The board is expected to grant a permit unless an official objection is filed against the plan. The plan calls for water injection on a five-spot pattern now used in adjacent leases.

A new gas-fired absorption refrigeration system developed by Southwest Research Institute at San Antonio, Tex., might speed the use of gas in air conditioning. The system shows a 50% improvement in performance while reducing fuel consumption by 30% and cooling water requirements by 25%, according to a Southwest Research paper presented at an AIChE meeting in Galveston.

Option on an undivided one-half interest in the 50,000-acre Fargo Oil Ltd., tract on the Southwest Innisfail Devonian reef trend is being exercised by Canada-Cities Service Petroleum Corp. Canada-Cities Service, as operator, is expected to spend up to $2 million and will spud a D-3 test before the first of the year. Canada-Cities Service and Fargo will each have a 50% working interest in the acreage.

Pipe of Tenite Butyrate cuts downtime

This pipe resists paraffin plugging

The problem of paraffin plugging is often completely eliminated with pipe made of Tenite Butyrate. The clean, smooth inner wall of this plastic pipe offers no toe-holds where paraffin can start accumulating. These smooth walls also provide up to 40% greater flow volume than does metal pipe for the same head loss. Result: less load on pumps.

Pipe made of Tenite Butyrate offers many other advantages, too. It resists corrosion caused by sour crudes, salt water and alkali soils. It is extremely light in weight. One 20-foot length of 4" pipe made of Tenite Butyrate plastic weighs only 20 pounds—about one-sixth the weight of metal pipe of the same length and diameter. It is easily cut with a hand saw and joined quickly with only slip-sleeve couplings and solvent cement. Using this method, three unskilled men can lay 4,000 feet of 4" pipe in only one working day.

With Tenite Butyrate, you get a pipe line that is easily installed, that performs efficiently, and requires virtually no maintenance. You also get the substantial savings that accompany each of these advantages.

Write us for more information, as well as the names of companies that produce pipe and a complete range of fittings made of Tenite Butyrate. Address: EASTMAN CHEMICAL PRODUCTS, INC., subsidiary of Eastman Kodak Company, KINGSPORT, TENNESSEE.

TENITE
BUTYRATE
an Eastman plastic

A 16-mm. sound-color film, "PLASTIC PIPELINES," is available upon request.

Gas Case Muddled

. . . again by FPC "compromise" to settle long-debated Midwestern plan to move Canadian gas to Chicago area.

THE QUESTION of who will serve the large Midwest natural-gas market —and when—grew more complex last week.

The Federal Power Commission staff offered its own solution in proposals which ran counter to both the intermediate decisions of FPC Examiner Francis L. Hall and to the plans of the competing pipelines.

If adopted, the course suggested by Harry Albrecht, staff counsel, would further delay the 3-year-old case.

An immediate effect would be to permit a 1-cent increase November 1 in the price of gas which Midwestern Gas Transmission Co. is to buy from Trans-Canada Pipe Lines, Ltd. It was to prevent this increase that Midwestern asked and secured a speed-up of the case (OGJ, Oct. 6, p. 120).

Counsel's argument . . . Albrecht conceded that Midwestern's proposal was the "best" of several before the commission in some respects.

But he found "serious faults" in all applications.

He objected strongly to Midwestern's proposal to import Canadian gas. Trans-Canada "doesn't have a single cubic foot of gas under contract which is available for the American market," he asserted.

Trans-Canada's reserves were placed by Albrecht at only 4.3 trillion cubic feet, but the company's own needs over a 25-year period will be 10.3 trillion cubic feet, he said.

Albrecht urged the commission to hold up decisions in the case to permit Michigan-Wisconsin Pipe Line Co. and Northern Natural to firm up their proposals to serve parts of the area. But he was critical of the plans of both as they now stand.

Michigan-Wisconsin's proposal, Albrecht said, "almost defies analysis," and Northern Natural's plan is feasible except for its reliance on Redfield storage.

He suggested that both companies be given another chance for markets north of Chicago. Hall previously had recommend that both applications be denied.

Midwestern's case . . . The staff proposals wound up a 2-day argument in which Midwestern urged that it be given a certificate for its project.

This calls for the import of 204 million cubic feet daily of gas from Trans-Canada to supply the northern part of the Midwest market and an equal volume from Tennessee Gas Transmission Co., its parent company, to supply the southern area.

Midwestern has an adequate supply of gas, Harry Littman told the commission in arguing for the company. The proposed line is economically feasible, it has an expanding market, and the company could make reasonable rates to consumers.

Littman charged that the opposing pipelines never attempted to supply the Midwest market and moved only after Midwestern filed.

A plea by Midwestern for a certificate conditioned upon its getting a firm commitment of Canadian gas within 90 days was strongly resisted by the staff counsel.

The Midwestern case was countered by Justin Wolf, representing Northern Natural, and Charles Shannon, of American Louisiana Pipe Line Co.

Both Shannon and Wolf said the commission could pave the way for the new Midwest service by issuing certificates to their companies, without conditions. And the companies are ready to get ahead with their projects, they said.

Leasing Changes

due soon for public lands in Alaska, western states.

NEW RULES to simplify oil leasing in Alaska and large areas of the western states will be adopted by the Interior Department before the end of the year.

The regulations will require future oil and gas leases on unsurveyed government lands to cover rectangular areas. Boundaries will run due north-south and east-west.

Under the new system, it was explained, the way "will be prepared for readily conforming leases to the rectangular survey system as soon as the lands are later surveyed."

The changes will apply particularly to Alaska, where development programs are being undertaken on millions of unsurveyed acres. Future leases there will be oriented to make them easily adaptable to the regular pattern of township, section, and subdivision lines.

Interior's Bureau of Land Management already uses "protracted surveys" in many unsurveyed areas to avoid the more complicated land descriptions based on metes and bounds. Exceptions are made along water boundaries and irregular official survey lines.

Interested parties have been given 30 days to submit objections or comments on the proposed new regulations.

Big Winter Fuel Bill Forecast

AMERICANS will spend more than $5 billion to heat 46,200,000 homes this winter. And as in the past, most of the heat will come from oil and gas.

A new study by the National Fuel-Oil Council shows that oil provided 44% of the total last winter, costing consumers $2,400,000,000. Gas was second with 33%, costing $1,600,000,000. Coal and all others accounted for 23% at a cost of $1,000,000,000.

Oil is used in 9,028,284 centrally-heated and 7,000,000 noncentrally-heated homes, most of which are in the north half of the country. Gas is used in 9,797,800 centrally-heated and 13,200,000 noncentrally-heated homes, most of which are in the warmer states closer to gas fields.

In comparison, coal heats less than 7,000,000 homes, and electricity about 400,000. The council said studies show that oil and gas are becoming almost exclusively the heat for new homes and are winning customers away from coal in older homes.

PROCESSING

Exclusive rights to Dr. Eugene P. Schoch's gas conversion process have been sold to Esso Research & Engineering. Humble has been granted rights to use the process. The deal with Esso also includes all future patents Schoch obtains in this field. The process converts petroleum gases into acetylene under influence of a specially developed type of electrical discharge.

Schoch, 87, is chemical engineering professor emeritus at the University of Texas, having served 60 years on the faculty.

A third alkylation plant for western Canada will be built by Imperial Oil at its 18,000-bbl. Winnipeg, Man., refinery. The 650-bbl. plant will help make western Canada self-sufficient in gasoline supplies for piston-operated aircraft. Contract is expected to

New Test in Alaska

. . . planned by Standard of California near Kenai Peninsula discovery. Halbouty is moving top men north to prepare for Kenai wildcat.

A FOURTH Swanson River Unit test on Alaska's Kenai Peninsula is to be made by Standard Oil Co. of California at a site 1½ miles southwest of the unit discovery well.

The discovery was recently placed on production after being shut in since its completion last year. The crude is being trucked to Seward and then shipped by tanker to the United States for processing. Initially, the well tested for a potential of 900 bbl. daily.

The discovery was made a year ago by Richfield Oil Corp., then operator. Shortly after hitting pay with the first wildcat, Richfield made a deal with Standard of California, pooling their Kenai Peninsula holdings with Standard taking over as operator. The two companies share an 89½% interest in the unit. Union Oil Co. of California and Ohio Oil Co. hold the remaining interest.

An extension test drilled 2 miles south of the discovery was never completed. It is carried officially as "suspended," but reliable sources report it will be a commercial well when finally completed.

An active drilling project is under way ½ mile northeast of the discovery, but Standard of California reports it is having circulation difficulty. It's at 12,209 ft. and appears to be still within the pay found by the discovery well.

Other activity . . . Oil interest in the forty-ninth state is picking up steam.

Michel T. Halbouty of Houston will let contracts shortly to construct roads and clear the location for his first Alaskan drilling venture — just 3½ miles southwest of the Kenai Peninsula's confirmation well.

Three officers of Halbouty Alaska Oil Co. (Halasko) are en route to Alaska to select a location for company offices and arrange for permanent personnel.

The three men are stopping at Los Angeles to arrange for shipment of 1,500 tons of equipment and materials, including a complete rig and spare parts.

Halasko and King Oil Co., operating jointly, expect to start drilling in February or March on a 5,400-acre Kenai farmout lease which offsets the discovery area (OGJ, Sept. 29, p. 47).

Humble Oil & Refining Co. recently passed the first anniversary of operations on a wildcat in the Widebay-Kanatak area on the Alaska Peninsula (OGJ, Sept. 8, p. 68, and Nov. 11, 1957, p. 116-117).

This wildcat, on the Bear Creek Unit about 350 miles southwest of Anchorage, has been plagued by trouble virtually since it was started. At last report is was at 12,288 ft. and Humble was circulating and conditioning mud for lost circulation.

Colorado Oil & Gas Corp. is nearing the programed total depth of 11,000 ft. on its wildcat at Cape Fairweather on Yakutat Bay about 400 miles east of the successful Swanson River operations.

At Iniskin Bay, 130 miles southwest of Swanson River Unit and across Cook Inlet on the Alaska mainland, Alaska Consolidated Oil Co. expects to start drilling a wildcat before the end of the month on holdings formerly held by Havenstrite Oil Co. Alaska Consolidated was renovating equipment and facilities used by Havenstrite.

In the immediate vicinity of Anchorage, Anchorage Gas & Oil Developments, Inc., still listed its two wildcats at Susitna Flats as suspended at 4,049 ft. and 6,068 ft. respectively. This vicinity is about 25 miles north of Anchorage.

On the west side of the Alaska Peninsula, Great Basins Petroleum Co. recently concluded a comprehensive geological study of its huge holdings.

BRIEFS . . .

be awarded in November, with actual construction to begin by next May. Completion of the $3-million plant is scheduled in November 1959.

Other alkylation plants in western Canada are at Imperial's Calgary, Alta., refinery and British American's new refinery a Port Moody, B. C.

A new heavy-duty motor oil for gasoline and diesel-powered heavy equipment has been developed by Standard of Ohio. The new Sohio HD S-1 motor oil exceeds requirements set up for engine applications which are more severe than usual.

A big expansion has been completed by Leonard Refineries. New facilities include a 7,500-bbl. fluid catalytic cracking unit and a 1,100-bbl. HF alkylation unit at Alma, Mich., and a 140,000-bbl. products terminal at Lansing. A new 43-mile, 6-in. pipeline from Alma to Lansing has capacity of 12,000 to 15,000 bbl. daily.

The month-old strike has ended at the 34,700-bbl. Mandan, N. D., refinery of Indiana Standard. The plant went back on stream last week after a 2-year contract was signed with the International Union of Operating Engineers. The contract has the same terms as the previous one. No wage increase was granted, but a wage reopener after 1 year is provided.

A $750,000 program to expand and modernize its oil products compounding and packaging plant at Ponca City, Okla., will be started in December by Continental Oil. Conoco will build a 34,000 sq. ft. warehouse adjacent to the plant and install a new automatic blender - homogenizer, and other automatic eqiupment.

Also for Refiners . . .

IN THE NEWS: Hess' new refinery at Perth Amboy, N. J., is nearly completed—it was built in record time (p. 50) . . . Goliad has completed processing plant to handle Pembina gas (p. 53) . . . British American dedicates its first West Coast refinery at Port Moody (p. 54).

PLUS THESE TECHNICAL REPORTS: Electronic-controlled cat cracker operates successfully (p. 77) . . . Better materials of construction for petrochemical processing (p. 83) . . . Eastern States boosts Platformer capacity (p. 96) . . . Eunice extraction plant processes lean gas (p. 100).

Blowout Tamed After 5½ Days

. . . at Sinclair site. Myron Kinley crew dynamites derrick, pumps mud and cement into 11,511-ft. hole for final kill.

SINCLAIR Oil & Gas Co. used 3,800 sacks of 18-lb. mud and 4,650 sacks of cement to kill its 2 Peltier Farms in the Lake Boeuf area of Lafourche Parish, South Louisiana.

The blowout occurred when the drill string was out of the hole, except for two drill collars. The well, just 3,500 ft. southwest of the 1 Peltier Farms, blew a spray of gas, salt water, and sand into the air, sometimes as high as 400 ft.

Red Adair, aide to fire fighter Myron Kinley, worked with Sinclair to bring the well under control. The derrick was dynamited, falling with the drill pipe across the derrick floor (see photo).

Adair and his crew put new bonnets on the blowout preventers and new rams and were then able to pump the mud and cement into the hole to snuff the well.

The field is a high-gravity oil producer. No heavy gas pressure had been encountered previously.

Tract Off California Leased

AFTER A DELAY of several months, the California State Lands Commission has accepted the $770,837 cash bonus bid for Parcel B off the coast of Santa Barbara County.

The joint bid was made by Standard Oil Co. of California and Humble Oil & Refining Co. The 3,840-acre Parcel B was part of a five-parcel offering made by the state last summer which attracted a record of $55 million in cash bonuses (OGJ, July 7, p. 72).

However, while other parcels were attracting multimillion-dollar cash bids, only three bids were received for Parcel B. The largest was the Standard-Humble bid. The winners on the other four parcels were awarded leases by the state soon after the bids were opened.

The final score on the five parcels now stands: Two to Standard-Humble; two to a 42-member joint venture headed by Phillips Petroleum Co., Edwin W. Pauley, and Kerr-McGee Oil Industries, Inc.; and one to a joint venture of The Texas Co., Monterey Oil Co., and Newmont Oil Co.

Laverne Plant Contracted

SUN OIL CO. has awarded a contract to J. F. Pritchard Co., Kansas City, to build a gasoline plant to process 100,000,000 cu. ft. daily from Laverne gas field, northwestern Oklahoma.

The $3½-million plant will be operated by Sun, largest acreage holder in Laverne.

The plant, which will produce some 100,000 gal. of liquids daily, may be expanded to 150,000,000 cu. ft. daily when demand warrants. Residue gas will be sold to Michigan-Wisconsin Pipe Line Co., which started construction last month on a gathering system and 56-mile, 20-in. main line to connect the field to its system.

The contractor expects to complete construction by next July 1.

Berland River Tract Offered

A 10,080-ACRE tract slightly north of the A-8 Berland River, world's largest gas well, will be offered November 13 by the Alberta Department of Mines and Minerals.

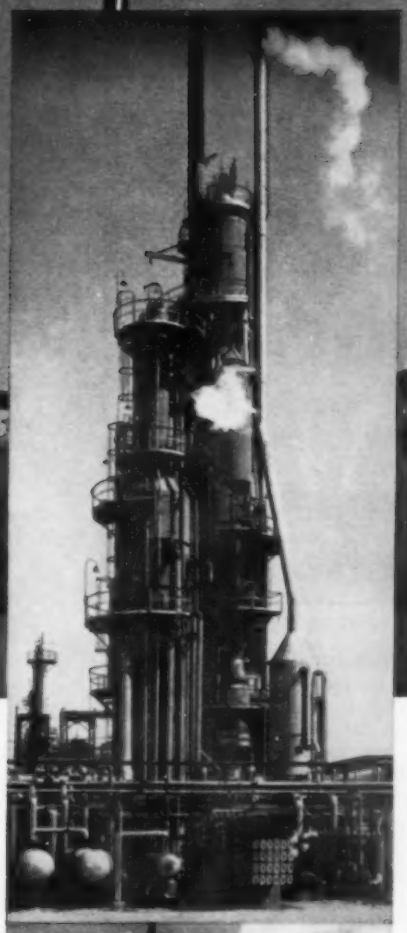
A total of 139,120 acres in 20 tracts will be offered at the sale.

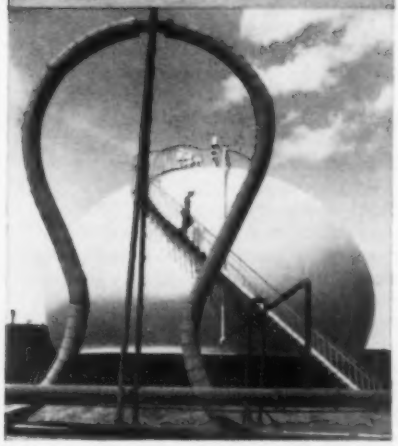
Alberta s October leasing sale of 4 parcels netted $2,026,538 for the provincial treasury. High bid was California Standard's $631,777 for a tract covering 6,395 acres in Woodbend field. Three other bids of over $200,000 were made.

Sun Oil Co. paid $448,333 for rights on 9,600 acres in Swan Hills; Pan American Petroleum Corp. spent $430,039 for 6,395 acres in Nevis field; and Henry S. McQueen leased 4,480 acres in the Coutts area for $240,000.

Where there's Refining

there's CB&I





CB&I structures serve two Anderson-Prichard Refineries

Wherever you find expanding refinery operations—you'll find the experienced *craftsmanship in steel* of CB&I. In 1951 CB&I fabricated and erected the reactor and regenerator, shown at left, at Arkansas City, Kansas, which was later acquired by Anderson-Prichard Oil Corporation.

Recently APCO completed a 7500 barrel-per-day UOP Cracker at their Cyril, Oklahoma refinery. Here again, CB&I fabricated and erected the reactor, regenerator and stripper units shown above.

Whether you're building new, or adding to . . . it will pay you to learn more about the *experienced* and coordinated engineering, fabrication and erection services that are available from CB&I. Write our nearest office for our new bulletin on CB&I *Field Services*.

P69CB

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• Above, right: 10-ft. diam. by 38-ft. reactor; 5-ft. stripper and 16-ft. diam. by 49-ft. regenerator were fabricated and erected by CB&I for APCO at Cyril, Oklahoma.

• Top, above: Components for this 4,600-bpd, UOP Catalytic Cracking unit at APCO Arkansas City Refinery were fabricated and erected by CB&I in 1951.

• Above: Hortonspheroid® at Cyril, Oklahoma APCO refinery.

Libyan Hopes Boosted by Fourth Find

• It's a promising sign for one of the biggest oil plays of the decade.

LIBYA'S first oil field came closer to reality last week with apparent success in the second wildcat drilled by Oasis Oil Co. of Libya.

The company's B-1-32 Dahra yielded 38 bbl. of 36°-gravity crude with no water in a 75-minute drill-stem test. The oil was recovered from a 50-ft. limestone formation between 3,758 ft. and 3,808 ft. The well was drilling ahead last week below 4,750 ft.

Oasis' Dahra well is 24 miles south of its Bahi 1 discovery. This well tested 75 bbl. of 39°-gravity crude on a 2½-hour test from a 32-ft. sandstone section considerably lower, from 5,822 ft. to 5,854 ft. The two wells are on the same structure.

The wildcats are on 1,225,000-acre Block 32. Bahi 1 is about 75 miles south of the Mediterranean Gulf of Sirte.

Oasis Oil, a wholly owned subsidiary of Ohio Oil Co., is operator on 62 million acres of concessions in Libya held jointly by Ohio Oil, Amerada Petroleum Corp., and Continental Oil Co.

The company was one of the last to start drilling in one of the biggest oil plays of the decade. A roster of companies exploring Libya reads like a who's who of the oil industry. The Oasis finds make four discoveries out of 29 wells drilled or drilling.

Here is a rundown of other operators:

... **Esso Standard (Libya), Inc.,** the Standard Oil Co. (N. J.) subsidiary, has been the most active company in Libya. It has punched down 10 wells in 16 months in the southern half of Block 1, in southwestern Libya along the Algerian frontier.

In North Central Libya, Esso has drilled two dry holes on Blocks 5 and 6 east of the Bahi discovery area. A third well, El Bdea, is at 1,069 ft.

Esso's Block 1 looked enviable because it offset CREPS' Edjele discovery across the frontier. But the 10 wells on surface structures in the southern half found nothing commercial. Atshan 2 came in at 500 bbl. daily. But the structure wasn't big enough to warrant development.

Esso's Fezzan wells have been shallow, 2,500-4,500 ft., and hole is made fast with a truck-mounted rig. Supply problems are enormous, however, because of desert conditions and long communication lines. The company keeps $250,000 worth of equipment on hand to insure smooth operations.

The rig and camp are now en route to a northern location across a desert of 500-ft. sand dunes. Surface structures are lacking in the new area, and wells will be drilled blind, on the basis of seismic locations.

... **Cie. des Petroles Total (Libye).** This French company was the latest operator to bring in a discovery. A Fezzan well 30 miles east of the Algerian frontier on Block 49 tests 8 bbl. an hour from a 75-ft. section below 4,600 ft. The French last week were coring just below 5,000 ft.

CPT picked up the acreage in a scramble for an open border area following the Edjele find. The company's first test on Block 23 further north was a duster.

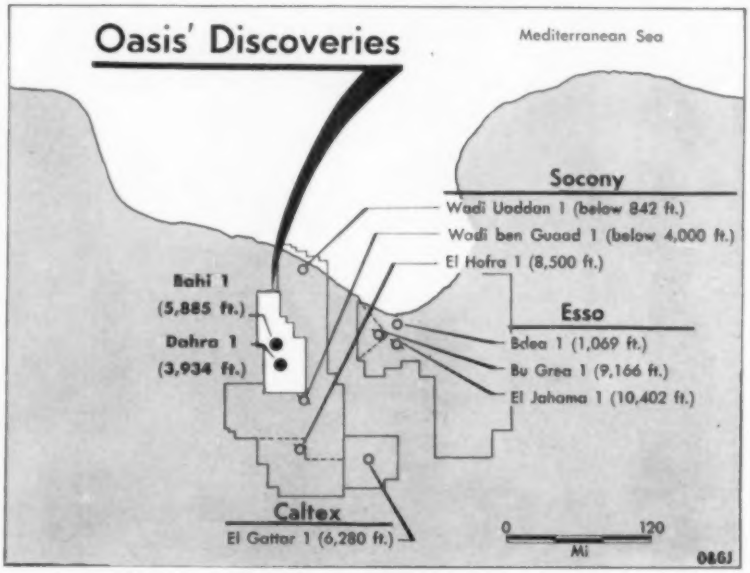
... **Anglo-Saxon Petroleum (Shell).** Royal Dutch-Shell last week was running casing to 8,224 ft. in its first try in Libya. The well is near the Algerian border on Block 52, which is squeezed between Esso's Block 1 and CPT's Block 49. The rights were acquired in the same scramble in which the French won their border acreage.

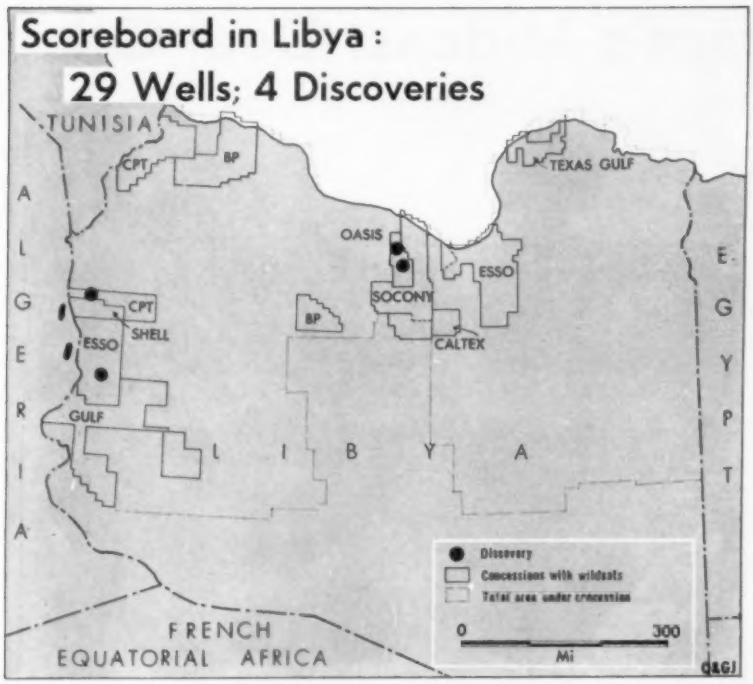
... **Gulf Oil of Libya.** Two shallow wells have been abandoned by Gulf Oil in Fezzan. A third, Takuni 1, is at 2,940 ft. It is the most southerly well so far drilled in Libya. Gulf's wells are located southeast of the southeast corner of Block 1, on sprawling Block 67. Gulf and Esso each tested different ends of the Geramna structure which straddles the concession line.

... **Mobil Oil of Canada, Ltd.** The operating subsidiary of Socony Mobil Oil Co., Inc., has concentrated its deep drilling in northern Libya on adjacent Blocks 11 and 57. A crew drilling below 8,653 ft. in the latest test at Wadi ben Guaad on the Mediterranean Coast is considered lucky because the locality is something besides raw desert.

Block 11 surrounds Oasis' Block 32 on three sides. Hofra 1 in the 8,500-ft. range had a small oil show but no commercial production. Socony's first test at El Gattar on Block 57, was abandoned at 6,280 ft. as a dry hole.

No deep tests have been started on the company's Fezzan acreage. But a core-drilling outfit last year topped a high pressure gas zone at 1,510 ft. on Block 50. More than 100 bags of cement were needed to kill the flow of 2,000,000 cu. ft. daily. A West German refiner, Gelsenberg Benzin, A.G., has acquired 25% interest in Socony operations.





. . . D'Arcy Exploration, Ltd. The exploration arm of British Petroleum Co., Ltd., is moving its rig to a new location after giving up on its second test. Wadi Zachem 1 on Block 63 was bottomed at 3,540 ft. The first test at Castel Benito on Block 34, which includes Tripoli, was abandoned earlier at 3,500 ft.

. . . Libyan American Oil Co. Libyan drilling was launched 2½ years ago by Libyan American, operator for Texas Gulf Producing Co. Four dry holes were drilled in northeastern Libya's Block 18. The last well, Farzugha 1, was the deepest. It was carried to 12,000 ft. in 3 months before it was abandoned in February. W. R. Grace & Co. has a minority interest in the operating company.

Other companies . . . The latest company to start a well was American Overseas Petroleum Co., operator for Caltex.

Its wildcat in the Gebel Uaddan area of Block 47 has resumed drilling after losing circulation at a shallow depth. The concession is southeast of the Bahi discovery.

Two concession holders have not yet started their drilling programs. They are Pan American Libya, a subsidiary of Pan American International Oil Co. (Indiana Standard), and Nelson Bunker Hunt.

Iranian Concessions Open

. . . but government apparently wants a cash bonus and a partnership deal. Firms reluctant to make that offer.

COMPANIES itching for a piece of Persian Gulf acreage and the Iranian Government are at a standoff.

National Iranian Oil Co. has announced that exploration concessions still are available and that "parts of oil areas 1, 3, and 4 which have not so far been granted are open to bid." This includes nearly 20,000 sq. miles of District 1, the offshore waters of the Persian Gulf. Another 40,000 sq. miles are open in Districts 3 and 4, covering southeastern Iran and the Gulf of Oman.

The government is believed holding out for offers of a cash bonus plus a partnership interest. It negotiated this type of contract earlier this year with Pan American International Oil Co., a subsidiary of Standard Oil Co. (Ind.). Pan Am added a $25-million bonus to a deal which gave Iran 50% of the profits, plus a 50% split of the remainder with NIOC (OGJ, May 5, p. 84).

Since then the government has rejected several other bids as unsatisfactory. One of those turned down is believed a cash bonus of more than $20 million for offshore rights offered jointly by Royal Dutch-Shell and Standard Oil Co. (N. J.). The bid did not include partnership for NIOC.

One small concession granted since the Pan Am deal, however, did not include a bonus. Rights on acreage near the Gulf of Oman in District 3 were awarded to a Canadian independent, Sapphire Petroleums, Ltd., Toronto. The agreement was similar to Pan Am's, except for the omission of a bonus (OGJ, June 30, p. 61).

Mexican Tests Fail

in Gulf of Campeche. Odeco drills another for Pauley.

A DRILLING OPERATION in the Gulf of Campeche off Mexico has failed to find oil, but the operators are still trying.

Since last summer Ocean Drilling & Exploration Co., associated with Pauley Pan American Petroleum Co. in the venture, has drilled four dry holes and has spudded a fifth test. All have been offshore efforts in water 30 to 50 ft. deep.

The drilling itself has been a successful operation from Odeco's new drilling barge, the "El Dorador" (OGJ, June 2, p. 89 and May 5, p. 84). The wells were drilled to about 6,500 ft. without major difficulty.

However, none of the wells had shows "worth talking about."

The Pauley company holds a permit from Petroleos Mexicanos, the Mexican oil agency, to test and develop up to seven geologic structures in an area 3 to 10 miles wide and about 180 miles long in the Gulf of Campeche.

Odeco has an agreement with Pauley that will qualify it for an interest in any production should oil be found.

Drilling so far has been in the extreme western part of the isthmus area near the city of Coatzacoalcos, State of Vera Cruz.

Maracaibo Station Slated

J. RAY McDERMOTT & Co., Inc., has been awarded contract to build and install a flow station in Lake Maracaibo for Venezuelan Sun Oil Co.

Design of separators, pumping stations, and other facilities is being done by Fluor Corp., Ltd., under a new service contract with McDermott.

Fabrication will start about mid-November at McDermott's Morgan City, La., yards. Cost of the plant is estimated to be almost $2,000,000.

Indiana Standard's Mideast Deal Off

- **Unprecedented terms would have jolted the oil industry.**

INDIANA STANDARD'S top officials have rejected Saudi Arabian terms for a concession deal that seriously threatened the traditional structure of Middle East oil.

The concession terms demanded by Saudi Arabia would have broken the long accepted 50-50 profit split formula. There has been serious erosion of this principle in the Middle East, but the new concession would have threatened it seriously.

After almost 2 years of sporadic talks with the Saudi Government about oil rights, Indiana Standard conceded last week that its top officers were finally considering a definite deal. Two days later the decision came down from the top. The terms offered by the Saudis are "completely unacceptable."

The big U. S. company, already expanding rapidly in foreign operations all over the world, still has not divulged the terms which it decided it won't accept. But, according to all reports they were similar to those accepted by the Japanese. The concession package would not only have broken the 50-50 formula, but would also have given the Saudis a share in refining and marketing profits, too.

Acceptance of the Saudi terms would have been a feather in the cap of Sheik Abdullah Tariki, Texas-educated head of Saudi Arabia's Department of Oil Affairs. Tariki has long demanded a more active role for his government in a world-wide integrated oil operation which would involve refining, transportation, and marketing of oil, as well as its production.

Frank O. Prior, chairman, and John E. Swearingen, president of Indiana Standard, ended the industry-wide speculation about the deal without completely slamming the door to more talks. The two officers said that "conversations involving oil concessions in the preferential rights area" of the country had been carried on by Pan American International Oil Co. and the Saudi Government.

"No agreement has been reached," the two officials said in a joint statement. "Terms offered so far by the Saudi Arabian Government have been completely unacceptable."

The area involved is almost in the center of the Arabian Peninsula in the region set aside as a preferential area for Arabian American Oil Co., the only company now operating in the country.

Under the terms of its concession, Aramco has the right to hold the preferential area by meeting the terms offered by any other company. This is highly unlikely under the proposed terms.

Reported terms . . . Indiana Standard officials would not confirm any details last week other than the fact they were considering a concession deal.

But the terms are widely rumored throughout the industry. They are:

. . . 60% of the profit to Saudi Arabia. This would have been even a better deal than the Japanese gave Saudi Arabia when they offered 56% of the profits for rights to the Saudi Arabia-Kuwait Neutral Zone's offshore waters in the Persian Gulf.

. . . A Saudi corporation would operate the concession. It would have two Saudis on the board and would not meet outside the country without the express approval of the government.

. . . All properties would revert to Saudi Arabia after 35 years.

. . . Compulsory integration of the company within 30 days after production reaches 1,500 bbl. daily.

. . . A refinery must be built in Saudi Arabia when production reaches 30,000 bbl. daily for at least 90 days. This refinery must produce a full range of products and would have to be expanded when production tops 75,000 bbl. daily.

. . . 10% of the company's stock must be offered to Saudi Arabian nationals.

. . . 10% of the oil may be taken by Saudi Arabia for internal needs and another 10% may be acquired for friendly Arab states.

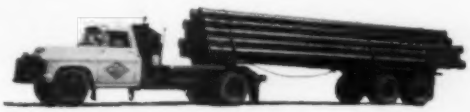
Except for the provision that Indiana Standard would have been required to pay 50% income taxes and additional royalties to make a total of at least 60% of the profits, these terms follow very closely those imposed on the Japanese. They are also the major points in a new oil law which the Saudis have been considering for months.

Preferential area . . . When Saudi Arabia granted its original concession in May 1933, the exclusive area contained 318,000 sq. miles with an ad-

Congrats and $25 to Doug Foster, Atlantic Refining Co., Dallas, Texas

Drilling for and producing oil and gas is a rugged business demanding great risk and courage. More, it requires plenty of rugged, dependable pipe. That's why Lone Star Steel was established in the heart of oil country.

The huge Lone Star plant, a modern miracle of automation and quality control, makes the kind of tough casing, tubing and line pipe American Petroleum Institute specifications call for. And, as Joe Roughneck knows, Lone Star offers a real convenience in fast, economical delivery.



Neighbor, wherever you are, specify Lone Star and we both get a good deal.

Lone Star STEEL COMPANY

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ditional 177,400 sq. miles in a preferential area.

Since that time Aramco has given up parts of the concession area on four different occasions, the last time in 1955 when the company relinquished about 33,000 sq. miles. In 1947, Aramco gave up a big strip of the preferential area to the west and north of the present zone which was at least three times the size of what is now left.

It was just a year ago that Aramco discovered a new field at Khurais, only about 20 miles east of the preferential area's western boundary. Since that time a 4-mile stepout to the discovery has been completed and a third well is being drilled. Khurais is 75 miles west of the country's producing fields.

The 50-50 split . . . If the Indiana Standard concession had gone through, it would have created new pressures on the companies already operating in the Middle East.

The traditional 50-50 profit split formula has already been breached in Iran and in the offshore Neutral Zone concessions, but so far there has been no effort to change existing concession terms.

It is considered highly unlikely that Aramco would have made a counter offer to offset the Indiana Standard terms.

When the Japanese concession terms were made public Tariki pointedly said that the new terms would have no effect on Aramco's long-standing concession terms.

If the Saudi Arabian oil chief still feels this way about it, Aramco, which produced more than 1,000,000 bbl. daily during the first 9 months of this year, may be able to hold the line.

Huge Rig to Be Airlifted

ONE OF THE BIGGEST airlifts of drilling equipment in history will be undertaken by Brown Drilling Co., Long Beach, Calif., in getting a 1,000,000-lb. rig to Ohio Oil Co.'s concession in the Peten area of Guatemala.

Brown will ship a new $1-million rig by water from Houston to Puerto Barrios on Guatemala's Atlantic Coast. From there it will be airlifted in 16,000-lb. loads in two C-82 Flying Boxcars to the drill site 100 miles inland.

The rig is scheduled to be shipped from Houston by the first of the year. Crews have been working for almost a year building an airstrip and a road in the Guatemalan jungle near the drill site.

Argentina Signs Deal

. . . with Odlum and Williams Brothers for 4,000 wells, big gas line. Final contract on 6-year job due next month.

ARGENTINA took another major step last week in its move to gain self-sufficiency in oil.

It signed a tentative agreement with a group of U. S. firms to carry out an ambitious, $800 million project over a 6-year period. It calls for drilling of about 4,000 wells and construction of a major gas-transmission line to Buenos Aires.

Participants in the agreement include four firms controlled by Floyd Odlum and a pipeline construction company, Williams Brothers. The Odlum firms are Atlas Corp., Hidden Splendor Mining Co., Petro-Atlas, Inc., and Mid-Continent Exploration Co.

Argentine President Arturo Frondizi announced last summer that negotiations were under way with the U. S. group (OGJ, Aug. 4, p. 70). Further details were added last week at the Argentine embassy in Washington where the agreement in principle was signed.

Final agreement is expected to be signed by November 12 after further details are worked out.

Drilling in '59 . . . The plan calls for the drilling of 7 million meters of hole for Yacimientos Petroliferos Fiscales in Comodoro Rivadavia field. Drilling is expected to begin early next year.

The gas line, to be about 2,100 km. in length, would extend from this field to Plaza Huincul and Buenos Aires. Diameter of the line has not been determined.

Plans call for the system to include a 60,000-hp. compressor station, described as the largest in the world.

Representing the U. S. group at the signing of the agreement were George Allen, of Hidden Splendor; David Stretch, Atlas Corp.; and John Williams, Williams Brothers.

Argentine officials emphasized that the agreement does not constitute a concession, but rather is a service contract. The participating companies are to be paid in YPF notes, and also will extend credits which will draw interest at the rate of 4.75% annually.

What's involved . . . Main points of the agreement call for the American group to:

. . . Advance $50 million in credit for 3 years to help YPF buy needed equipment, etc.

. . . Drill 7,000,000 meters of hole at locations selected by the government oil agency. Cost of the drilling program is estimated at about $300 million.

. . . Advance an estimated $95 million for construction of roads, tank batteries, gathering lines, and other projects. The group would be repaid for this work, with principal materials to be provided by Argentina.

. . . Construct the pipeline at an estimated cost of $220 million.

. . . Provide $5 million for construction of an Argentine plant to manufacture oil equipment.

. . . Advance $90 million in oil products over the life of the contract. Argentina is to pay 20% cash for these products. Remainder would be paid over a period of several years.

. . . Give $30 million credit to the central government bank for a 5-year term. This loan would draw interest at the usual bank rate in the U. S.

The Argentine Government is negotiating for a separate loan of $15 million to $300 million from a German firm, Ferrostal, AG. This loan would not necessarily be earmarked for development of the Argentine oil industry.

Paraguayan Camp Attacked

PARAGUAYAN INDIANS went on the warpath again, and an oil camp had to hold them off with rifle fire for 32 hours until army rescuers arrived.

A crew of 24 U. S. and Paraguayan engineers were surrounded by Moro Indians at dusk after camp had been set up near Madrejones in the North Chaco region. The party was prospecting for Pure Oil Co. of Paraguay, Inc., operator for a five-company group holding a 23,200-sq.-mile concession in the area.

A call for help got through to Pure's Asuncion headquarters the next morning, and army troops lifted the seige on the second day. The Indians pressed their attack with spears and arrows. They had poor aim and none of the crew was injured. At least one Indian was killed, and one wounded.

A road-building crew was raided several weeks ago. Troops will remain on guard this time.

Reds to Give Gigantic Push to Booming

• Spurred by big discoveries, Soviet planners aim at a daily production of 14 billion cubic feet and 16,000 miles of new lines by 1965.

WITHIN 15 YEARS, the Russians expect to reach the same point where the U. S. gas industry stands today.

Already the world's second largest user of natural gas, the USSR has given top priority to gas development and transmission as a key to over-all industry growth. The new order: Step up the already rapidly expanding industry "to a pace unprecedented in the history of any branch of the Soviet economy."

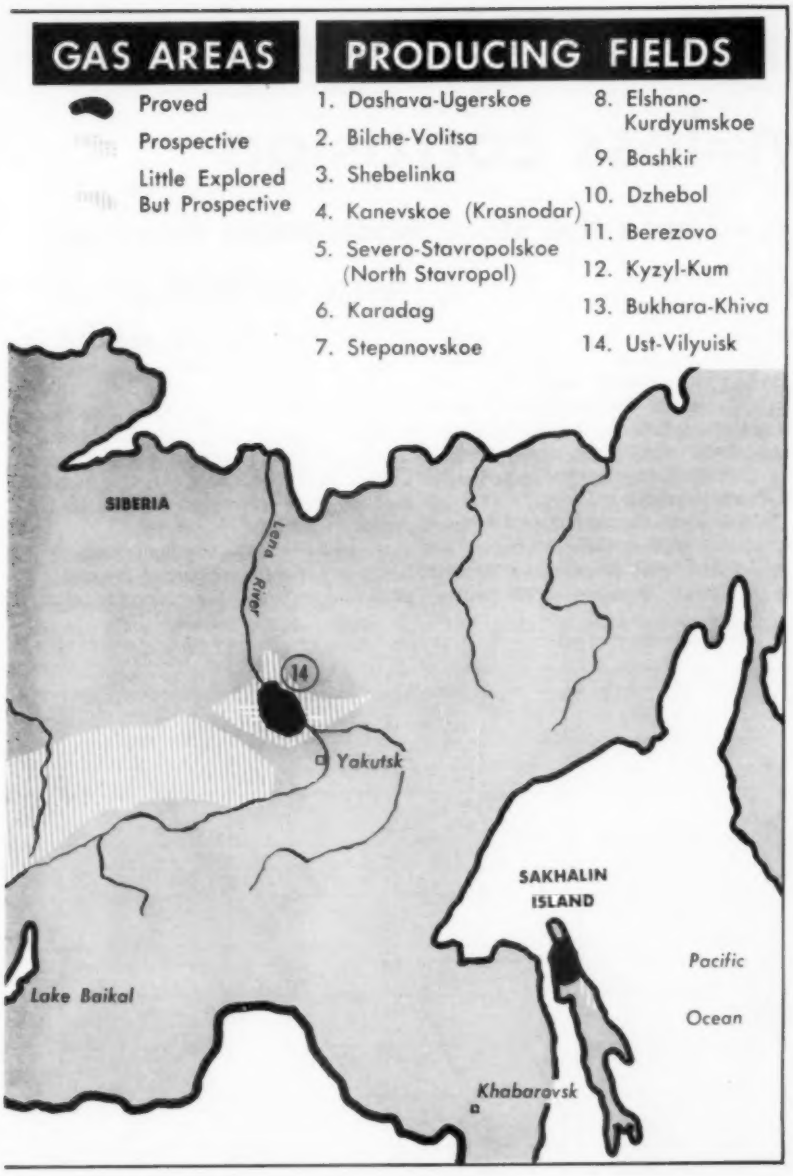
Backing up the big push are the rich new discoveries along the Volga River, the north Caucasus foothills, the Baku area, the Ukraine, the northern Ural Mountains, and the Uzbekistan Desert.

The production timetable of 14½ billion cubic feet daily by 1965 would be more than seven times the 1957 production of nearly 2 billion cubic feet daily in 1957. In comparison, U. S. production in 1957 was more than 29 billion cubic feet daily. The Russians hope to reach this figure by 1973.

Here are the goals for the 1959-65 period as outlined by the USSR Council of Ministers:

... **40 new trunk lines** totaling 16,146 miles. This is four times the 4,100 miles now in operation in Russia.

... **A drilling program** of 49.2 million feet of "deep" exploratory gas



Gas Industry

wells. The objective is to increase proven reserves by 107 trillion cubic feet.

... **Extension of gas service** to more than 300 additional cities and towns in all the nation's 15 union republics. The goal is to serve 500 cities with 68,000,000 population in 1965. This compares with service to 160 cities in 1958. In 1956, natural gas was going to 1,300,000 living units in 100 cities.

... **Increase the proportion of gas** in Russia's fuel balance from 6.5% in 1958 to 21% in 1965.

... **Expand manufacture** of drilling equipment, large-diameter transmission pipe (especially 32 and 40-in. sizes), compressors, pumps, pipe-laying machines, automatic and remote-control devices, and household gas appliances.

The supply . . . The latest Soviet decree states flatly that recent exploration shows the country has "inexhaustible" supplies of natural gas.

Russia claims that natural-gas reserves in the new Bukhara-Khiva field in Uzbekistan (No. 13 on map) total "at least 45.9 trillion cubic feet."

Twenty years ago, Russian reserves were estimated at 35.3 trillion cubic feet. Soviet geologists now say that "when our little-explored gas-bearing areas are taken into consideration, it can be said that the USSR ranks first in the world in natural-gas resources."

The USSR claims to have discovered about 200 gas fields "in recent years."

Gas lines . . . By the end of 1965, every major industrial region in Russia, except the Far East, will be receiving natural gas.

Most of the main population areas in European Russia, as well as the large metal mining and processing centers just east of the Ural Mountains, will be getting gas from at least two sources.

Moscow is already receiving natural gas from three directions: Saratov to the southeast, Stavropol in the northern Caucasus, and the pre-Carpathian Mountain area near Lvov in western Ukraine.

A second Stavropol-Moscow line is now under construction, and new links are planned from the Kanevskoe field near Krasnodar on the northeast coast of the Black Sea and from the "Second Baku" area between the Volga River and the Ural Mountains.

Since 1956, discoveries in Soviet Middle Asia near the ancient city of Bukhara have been a major factor in boosting Russian gas production.

First the Russians announced that Bukhara gas would be delivered eastward to Samarkand and north to Tashkent. Then, as estimates of the new field's reserves soared, two new lines, each more than 1,200 miles long, were projected from Gazly, near Bukhara, northward to the big Ural Mountain metallurgical centers of Sverdlovsk and Chelyabinsk.

Latest plans call for still another line going northeastward from Tashkent to Chimkent, Dzhambul, Frunze, and Alma-Ata, near border.

Why the push . . . Premier Khrushchev has given a simple answer to why gas production will be speeded up.

He says gas, as well as oil, must be developed or the Russians will have a hard time catching up with leading capitalist countries.

Plans are being made to use gas for power plants and industry as well as dwellings. Russian leaders are also counting on gas as a foundation for the petrochemical industry.

Russia is also planning a major increase in crude production, with hopes of reaching the 8-million-barrel daily level in 15 years (OGJ, Feb. 24, p. 100).

And there is speculation that the Soviets plan to try to enter free-world export markets on a large scale within a few years (OGJ, Aug. 25, p. 62).

Less oxygen=less corrosion

--That's the story when water flooding with oil-field brine

BY L. C. CASE AND W. C. WHITESIDE
Gulf Oil Corp.

LABORATORY DATA, confirmed by field operation, show that oxygen in brines has appreciable effect on corrosion of steel, down to a concentration of 0.3 p.p.m. And a rate of 5 mils per year or greater should be expected when most brines contain as much as 1 p.p.m. oxygen.

An open water-flood system has been operated for 1½ years with entirely satisfactory results, using these findings.

The results of this study seem especially worth while at this time, in view of the existing lack of agreement concerning the effect on steel corrosion of varying amounts of oxygen in brines.

Role of oxygen . . . It is rather freely admitted by men who study corrosion phenomena that the role of oxygen is clearly defined only qualitatively. Correlation of corrosion severity with oxygen concentration and other modifying factors cannot be exact. While oxygen in brines may be a direct cause of corrosion, present knowledge does not permit accurate prediction of corrosion rate under any given set of conditions.

The few laboratory data which have been published are difficult or impossible to interpret in terms of field practice. No doubt this is largely due to the difficulty in making significant and accurate field tests and to the additional fact that laboratory tests simulate only a few existing field conditions. The points in general agreement concerning oxygen corrosion are about as follows.

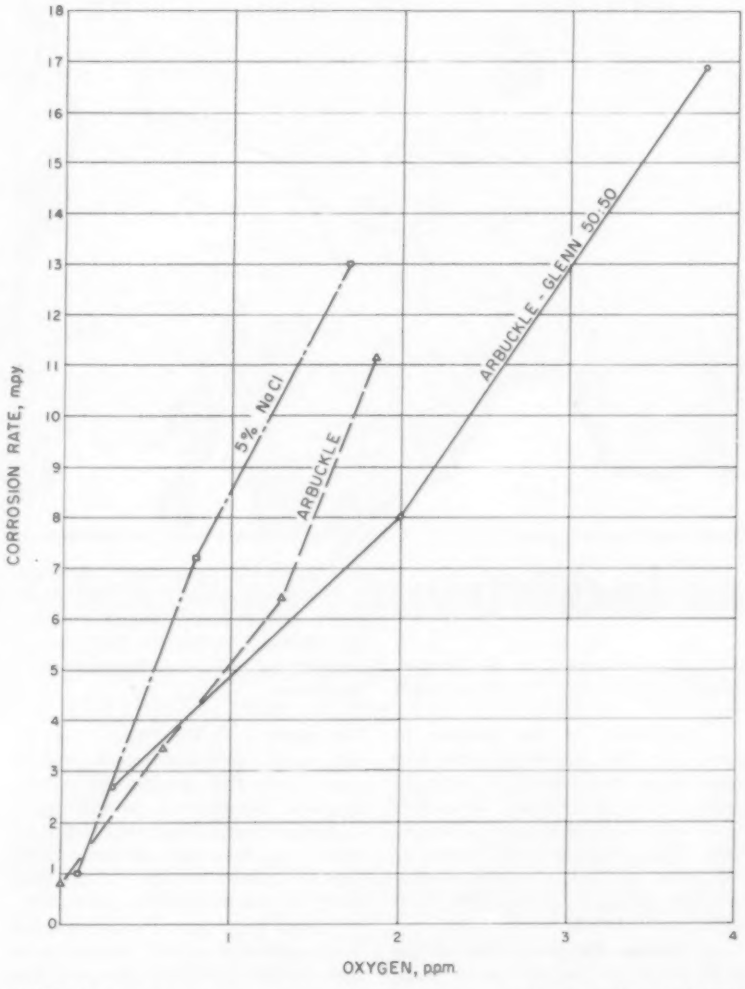
1. Dissolved oxygen in brines causes corrosion, with a tendency toward reduction in corrosion rate with increased salinity above the approximate region of 3-4%.

2. Efficient organic inhibitors of oxygen corrosion in brines have not been found. Although certain materials have limited use at given locations, these must be established by field trial rather than by knowledge of conditions attendant to the corrosion.

Obviously, it would be helpful to know, precisely, what concentration of oxygen in a given brine would cause a certain degree of corrosion. If for example, a relatively high level of oxygen could be tolerated for the predicted life of a water flood, then the expense of making the system airtight, or that of lining the equipment, might be obviated.

Earlier published literature[1 2 3 4] has shown in general that corrosion by oxygen is roughly proportional to the amount dissolved in a corroding solution. The effects of various electrolytes or their concentrations have not been clearly set forth, although it has been known that increasing salt content may decrease corrosion, due to decreased solubility of oxygen.

A more recent article presented laboratory data in support of the conclusion that "while the corrosion rate



CURVES showing corrosion rate as a function of oxygen concentration indicate only a general effect of decreased rate in the more saline brines. Fig. 1.

of steel is essentially linear with dissolved oxygen, it appears to fall almost to zero near 1 p.p.m. instead of at zero p.p.m. dissolved oxygen as commonly assumed."[5] It should be noted that these tests were made in 3% sodium chloride solutions. Thus, it might be assumed that lower oxygen concentrations in the order of 0.5 p.p.m., should be quite harmless in any brine being handled in unprotected steel equipment.

It is believed that assumptions of this nature could lead to serious, early trouble in the operation of most waterflood projects under normal conditions. It is the main purpose of this report to set forth both laboratory and field observations on dangerous corrosion rates occurring in various brines where oxygen was considerably below 1 p.p.m.

Calcium carbonate films . . . Reference is also made to the protection given steel equipment by calcium carbonate films. In the handling of fresh water such films doubtless afford a measure of protection under mildly corrosive conditions, and variations of the method have been used for many years. A recent publication[6] has suggested controlled supersaturation in oxygenated brines so that a protective film of calcium carbonate will be formed on the interior of the distribution equipment.

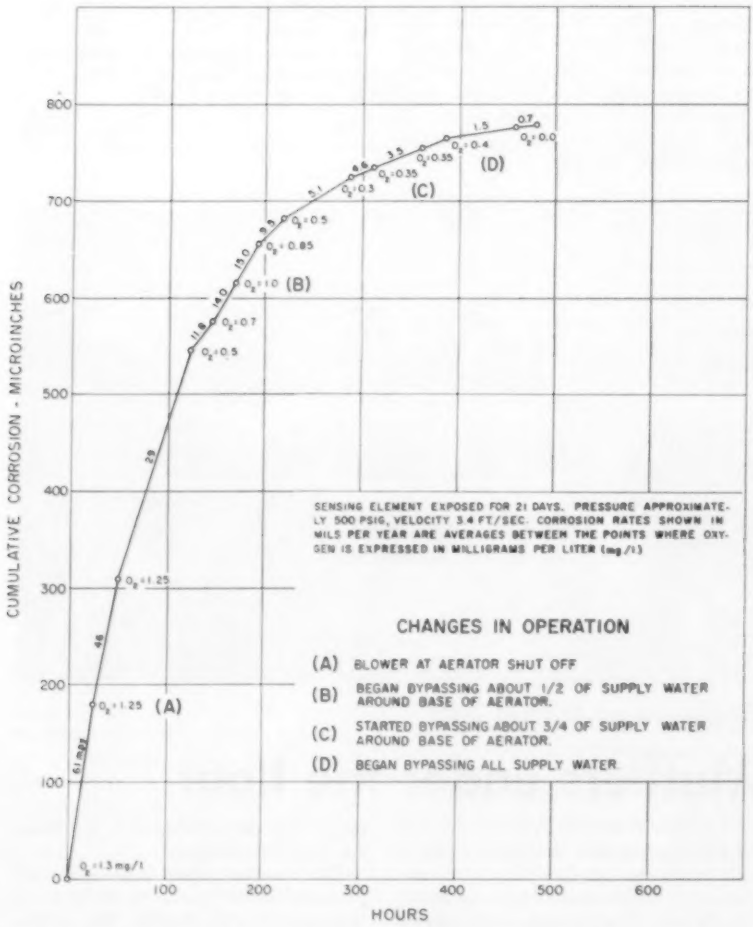
The protective value of such coating is questionable in view of its porous, discontinuous nature and the pitting attack which has been reported in aerated, supersaturated brines.[7] The authors have observed many examples of severe corrosion on steel equipment where the pitting attack due to dissolved oxygen was accompanied by discontinuous calcium carbonate scale.

In one extreme case a new 6-in. line became perforated at many places after only 1½ years' service. Inadequate protection was also illustrated at a drilling well where lime water and air was being used. Water entering the well bore was quite fresh, having a pH value of 12.5. Fluid leaving the well had 46,000 p.p.m. total solids and pH of 11.8. Average corrosion rate of the return fluid was found to be 15 m.p.y.

It seems entirely possible that the accelerated and expanded field monitoring programs now practiced by many water-flood operators may soon lead to a better understanding of permissible oxygen levels in water to be handled by unprotected steel equipment. New and improved testing instruments, similar to those used in the following field and laboratory investigations, should contribute to this end.

TABLE 1—LABORATORY MEASUREMENT OF OXYGEN CORROSION IN BRINES

Brine—	Oxygen, p.p.m.	Corrosion rate, m.p.y. Probes	Coupons	Duration of test
5% NaCl	0.1	0.1	1.1	7 days
	0.8	7.3	6.4	64 hours
	1.8	13.1	14.7	27 hours
Arbuckle	0.0	0.77	0.16	32 days
	0.6	3.5	4.2	92 hours
	1.3	6.4	6.5	98 hours
	1.85	11.2	13.7	66 hours
Arbuckle-Glenn 50:50	0.3	2.7	3.3	10 days
	2.0	8.1	9.5	68 hours
	3.8	16.9	19.1	54 hours


CUMULATIVE CORROSION - MICROINCHES
HOURS
SENSING ELEMENT EXPOSED FOR 21 DAYS. PRESSURE APPROXIMATELY 500 PSIG, VELOCITY 3.4 FT/SEC. CORROSION RATES SHOWN IN MILS PER YEAR ARE AVERAGES BETWEEN THE POINTS WHERE OXYGEN IS EXPRESSED IN MILLIGRAMS PER LITER (mg/l)
CHANGES IN OPERATION
(A) BLOWER AT AERATOR SHUT OFF
(B) BEGAN BYPASSING ABOUT 1/2 OF SUPPLY WATER AROUND BASE OF AERATOR.
(C) STARTED BYPASSING ABOUT 3/4 OF SUPPLY WATER AROUND BASE OF AERATOR.
(D) BEGAN BYPASSING ALL SUPPLY WATER.

CHANGES IN OPERATION necessary in a 21-day investigation to effect good control. Forced-draft aerator puts too much air in brine. Aeration was still excessive when supply brine was sent over the tower without the blower. Fig. 2.

Laboratory

Some laboratory tests were set up for the purpose of indicating optimum operating conditions at a water flood where it was necessary to aerate a brine for removal of hydrogen sulfide. In all tests a mixture of nitrogen and oxygen was bubbled through brine so that a constant dissolved-oxygen concentration was obtained. The gases were mixed in a pressure cylinder and then fed to the brine tank at a constant rate through a fritted disk.

Fluid in the tank was kept in motion by a magnetic stirrer. Ratio of the mixed gases and brine salinity allowed a rather close approximation of dissolved oxygen. However, oxygen was determined by the Winkler method at various periods during each run. Corrosion rates were measured by re-

sistance probes and by coupons of SAE 1010 steel.

The coupons were used for several reasons. They offer more surface for inspection after each run, a check on the probes is provided and something as to optimum exposure time for coupons under field conditions is believed indicated. Following the tests using c.p. NaCl, 5% in distilled water, a natural brine, and a brine mixture were also used. The brine analyses are:

	Arbuckle brine (supply)	Glenn brine (produced)
Sp. gr.	1.134	1.031
H_2S, mg. per liter	21	Nil
pH	6.0	6.8
Ca, mg. per liter	12,400	3,410
Mg, mg. per liter	2,520	495
SO_4, mg. per liter	2	35
Cl, mg. per liter	119,600	24,700
HCO_3, mg. per liter	68	242
Fe, mg. per liter	Trace	20 to 70
Ba and Sr	Not found	Not found

Arbuckle brine was the main supply at the open water-flood system under consideration and a more dilute brine, produced from the Glenn sand, was commingled. Results of the laboratory corrosion tests are compared, Table 1.

These data show fair agreement between corrosion probes and coupons, when comparing stabilized probe rates to average coupon corrosion rates. A similar relationship has been noted in the field. The curves, Fig. 1, showing corrosion rate as a function of oxygen concentration, seem worthy of some study and comment. Only a general effect of decreased rate in the more saline brines is indicated.

Certainly, no plausible curve using salinity vs. corrosion rate could be constructed from these data. The point of greatest significance seems to be that corrosion, in the order of 0.8 to 3.5 m.p.y. is shown for oxygen contents from 0 to 0.6 p.p.m. At 1 p.p.m. oxygen the rate jumps to around 5 m.p.y. which produced noticeable pitting in a relatively short time.

If the four points obtained at less than 1 p.p.m. oxygen are considered exclusively, the indicated rate seems to be rather clearly established. Thus, it was logically concluded that an open water-flood system using mixtures of these brines should be regulated to maintain the average oxygen content of injection brine at 0.5 p.p.m. or below.

Field Testing and Plant Control

The flood system under consideration was equipped with aerating tower and blower, settling basin and filters. The Arbuckle supply brine and produced Glenn brine could be mixed in the flume at the base of the tower

"The flood system under consideration was equipped with aerating tower and blower, settling basin and filters."

or aerated over the tower as desired. Since a low residual oxygen content was desirable, the produced brine was not aerated. It remained then to regulate the aeration of supply brine so that H_2S would be removed, leaving 0.5 p.p.m. oxygen or less in the mixed brine as it left the settling basin on the way to the filters.

Fig. 2 illustrates graphically the 21-day investigation and changes in operation necessary to effect good control. It will be noted that the forced-draft aerator put too much air in the brine. Aeration was still excessive when the supply brine was sent over the tower without the blower, as shown by oxygen contents ranging from 0.5 to 1.0 p.p.m. many hours after water in the pit has been used.

Successive stages of bypassing brine around the tower finally proved that both blower and tower were unnecessary. Introduction of both supply and produced brine directly to the pit through a flume brought about the desired result. Shortly after changing to this method of operation, pit effluent to filter was found to have zero oxygen and only infrequent traces of H_2S. Supersaturation averaged about 9 p.p.m. and pH near 6.8.

Under the given conditions, corrosion probes showed a satisfactory low rate. It was assumed that operation of this plant under closely similar conditions should not encounter trouble from either corrosion or scale deposition. No corrosion or scale has been experienced for 1½ years. Longer observation will not be possible due to a change from brine to fresh water for injection.

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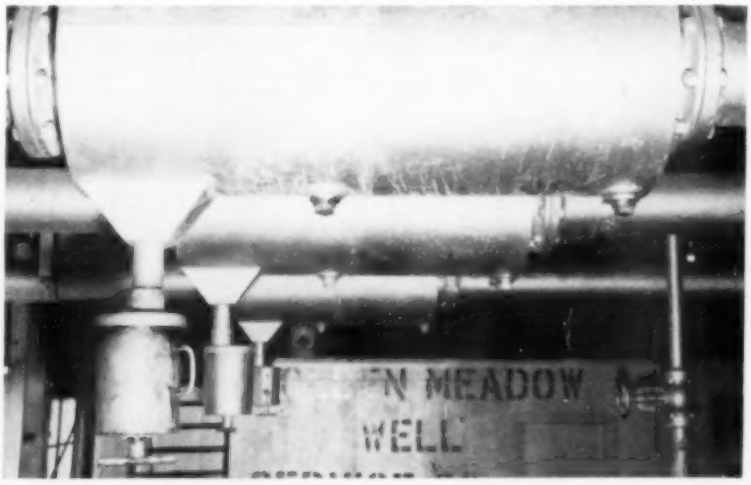


Engineers on this rig built

Mufflers under the floor

ON THIS INSTALLATION on one of Golden Meadow Well Service Co.'s rigs working off of the Louisiana coast, the mufflers are rigged up under the derrick floor so that water can be added to the exhaust when drilling high-pressure formations and the excess drained off so that it will not come out and splatter the rig when the wind is wrong.

The exhaust pipes inside the case pass each other so as to make a reverse flow and muffle the sound. When water is turned into the exhausts at the engines, the traps on the mufflers drain excess water.

Regent engineers report success for a completely

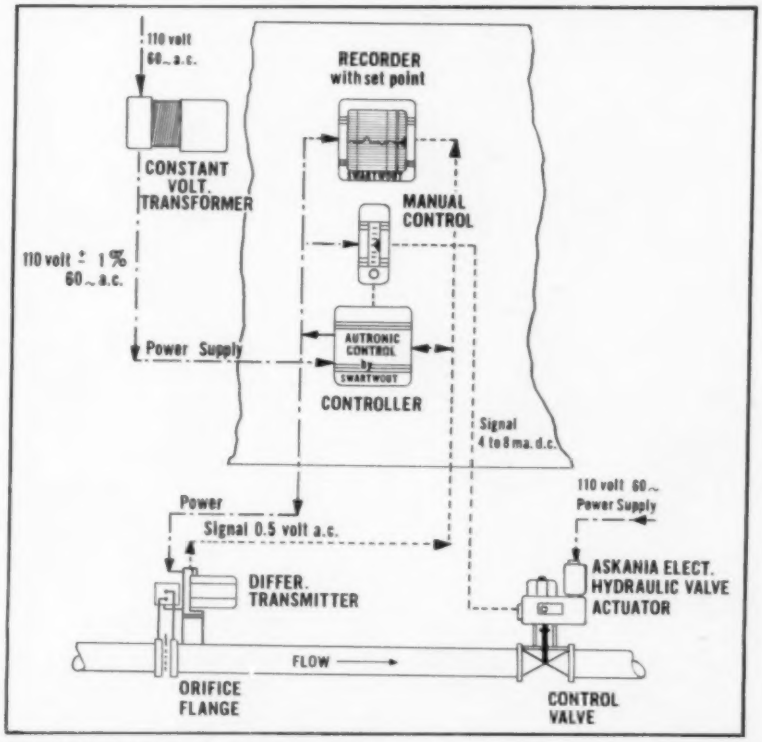
Electronic-controlled cat cracker

AT the Port Credit, Ont., refinery of Regent Refining (Canada), Ltd., subsidiary of McColl-Frontenac Oil Co., an all-electronic-controlled cat cracker has been in operation.

On the basis of experience gained with this unit it is felt that electronic instrumentation is generally superior in performance to pneumatic-type controls, provided that a reliable source of electrical power is available at all times. Early difficulties due to surges in power supply will be overcome through installation of a motor-driven generator set.

Inherent advantages of electronic control in terms of higher sensitivity and high speed of response have been realized. Rapid checking of electronic instrumentation by plug-in meters and substitution of plug-in components make this equipment easy to calibrate and provides much greater in-service accuracy.

Positions of the regenerated-cat and spent-cat slide valves are controlled according to reactor temperature and reactor bed level respectively. However, both these slide valves are equipped with overriding differential pressure controls. These take over if differential pressure across slide valves drops below a minimum. This system has proved quite reliable.



ELECTRONIC CONTROL LOOP has differential pressure across transmitter diaphragm translated into a 0-0.5-volt a.c. output signal. This is compared with a reference voltage through error detecting section and the error, after modification, comes out as a 4-8 ma. d.c. signal. Fig. 1.

Port Credit Refinery

The refinery runs about 25,000 bbl. per day of western Canadian crude oil and comprises crude stilling, vacuum flashing, visbreaking, Platforming, fluid cat cracking, and polymerization. In 1955 a new crude-distillation unit was completed which served as a testing ground for Regent for electronic instrumentation.

At that time pneumatic control valves only were available and electropneumatic conversion units were mounted at each valve to convert the electrical output of the controllers to a pneumatic signal to drive the valve meters.

Since that time, in 1957, another panel has been added to this board to control the vacuum flashing unit. The crude unit started up with little or no difficulty and the performance of the unit from then on indicated to Regent that electronic controls could do a better control job reliably with simple maintenance than equivalent pneumatic units.

Paper presented at WPRA Wichita regional meeting.

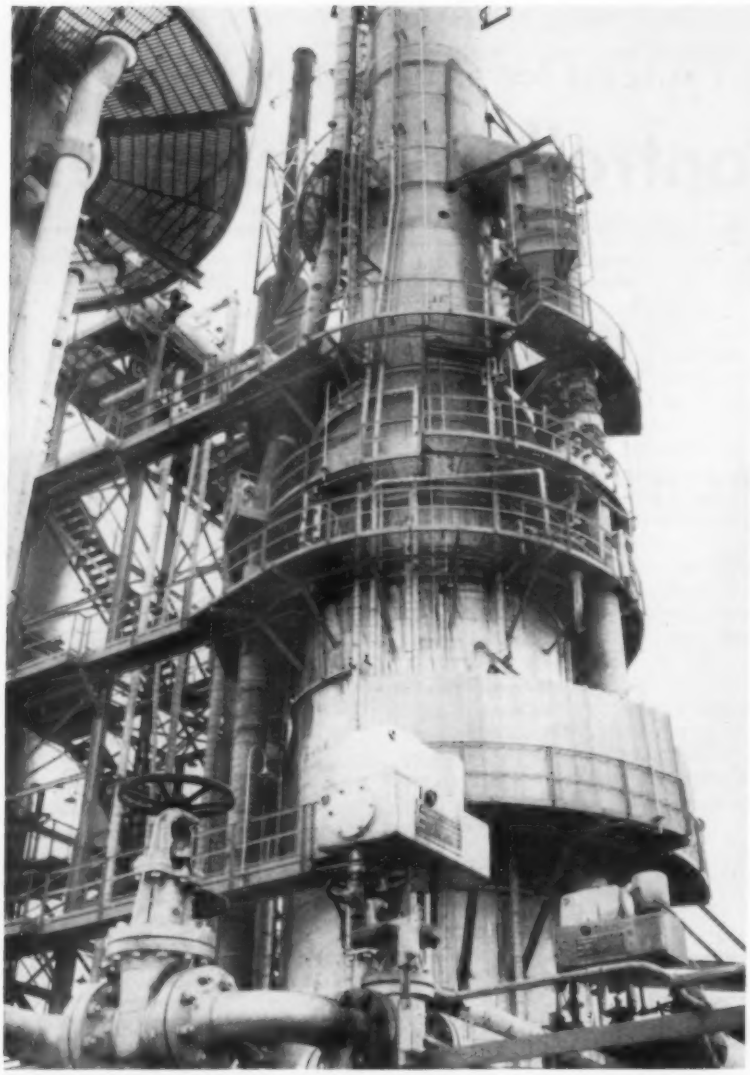
Cold-weather bug . . . One of the few bugs that developed with the instruments during the fall of 1955, before the unit was completely winterized, was during a cold snap when the fluid in the differential-pressure transmitters became very viscous, and the operators put steam hoses on them. Three of the transmitters failed when the bodies filled up with water, but the manufacturer has since replaced all of the transmitters with hermitically sealed units which can operate completely filled with water.

Electrohydraulic . . . During the operation of the crude unit in 1956, an electrohydraulic valve operator was installed on the main-tower-top reflux-temperature controller. Operation of this valve was so good that when the cat cracker was designed, it was decided to couple electronic instrumentation to these electrohydraulic operators.

BY C. D. GINGRICH
Regent Refining (Canada), Ltd.

Electronic Control Loop

In the electronic control loop (Fig. 1) the 110-volt, 60-cycle power is fed to a constant voltage transformer which maintains voltage within 1% of its set output at some value about 100 volts. This power is then fed to the mounting frames of the controllers and, from there, to the differential transmitter. Deflection of the diaphragm and consequent movement of an iron core inside a differential transformer, translates the diffential pressure across the diaphragm into an output from the differential transformer. This output is in the form of a signal of from 0 to 0.5 volts a.c.



ELECTROHYDRAULIC VALVE ACTUATOR mounted at base of cat cracker reactor-regenerator at Regent Refining (Canada) Port Credit refinery. Fig. 2.

This a.c. signal is then fed back to the mounting frame of the controller and on to a rotary solenoid on the pen arm of the recorder in parallel to give the flow as a percentage of the differential range of the transmitter.

Set-point unit . . . Power from the mounting frame of the controller is fed to the set-point unit which is physically located in the recorder to facilitate its adjustment from the face of the panel by the operator. This set-point unit is another differential transformer with an iron core mechanically positioned to produce a reference voltage corresponding to the desired reading or differential pressure across the transmitter diaphragm.

This reference voltage is then fed back into the controller (along a line not shown on the sketch), along with the output of the differential pressure transmitter. The two signals then go through error detecting and amplification sections, then through a rectification section. The error is then modified through the proportional, reset and rate networks and comes out of the controller in the form of a 4-8 ma. d.c. signal.

This signal is fed to the manual-automatic station and, in the automatic position, on to the control-valve positioner. In the manual position this signal is interrupted at the station and a manually adjustable signal of from 4-8 ma. is sent out to the valve. Check positions on the manual-automatic station allow completely bumpless transfer between the two positions.

Electrohydraulic Valve Actuator

Fig. 2 illustrates one of the Askania electrohydraulic valve actuators at the base of the cat cracker reactor-regenerator at Port Credit. Fig. 3 shows a cutaway of a valve actuator and illustrates how it works.

Jet-pipe principle . . . A ½-hp. electric motor drives a gear-type hydraulic oil pump which picks up oil from the reservoir of each valve and delivers it at 200 psi. to a pivoted jet tube. This jet tube, depending on its deflection, delivers oil to either of two receiving orifices which then feed one side or the other of the power piston which is coupled to the valve stem.

Deflection of the jet tube is controlled by the 4-8 ma. output of the controller or manual station which is fed to a coil mounted on the jet pipe in the field of a permanent magnet. A feed-back spring from the power cylinder holds the jet tube in position when the tension in the spring due to valve position is equal to the force developed electrically. The core and coil can be arranged so that the valves will fail-safe either open or closed on signal failure from the controllers.

In case of failure of power to the oil-pump motor or any failure of the hydraulic system, a locking device in the form of a double-ported spring-loaded valve in the lines to the power cylinder, which is normally held open by the discharge pressure of the pump, will close and hold the valve in its last position of control.

Transmitters

Pressure transmitters are similar in form to the differential-pressure transmitter in that they employ a diaphragm actuating the differential transformer. Liquid-level transmitters are either of the differential-pressure-measuring type or of the displacer-float type where the torque-tube output of the displacer actuates the differential transformer.

The Author

C. D. GINGRICH is operating foreman of the Regent Refining plant at Port Credit, Ont. He has worked continuously since graduation with Regent as process engineer, process-design engineer, construction supervisor and as general supervisor of operating units in the refinery.

Port Credit Cat Cracker

The fluid catalytic cracking unit (FCCU) and its fractionation section, as well as the gas-concentration section and a polymerization unit are all on electronic control. Fig. 4 shows the control panel for the installation. The FCCU was designed for a charge rate of 7,000 bbl. per day of atmospheric and vacuum gas oil at 26°-27° API and to operate at a conversion level of 70%.

The unit is basically powered by electricity. The main air blower, the gas compressors and poly-charge pump are all electrically driven with no alternately driven spares. All normal operating pumps are electrically driven but have steam-driven standbys, the only exception being the slurry reflux pumps which are steam-driven and supply 50 psig. exhaust steam for stripping of catalyst and gas oils.

Blower control . . . The flow of air from the air blower is controlled by the positioning of inlet guide vanes by an Askania operator and flow to the gas compressors is controlled by sequential valve lifting.

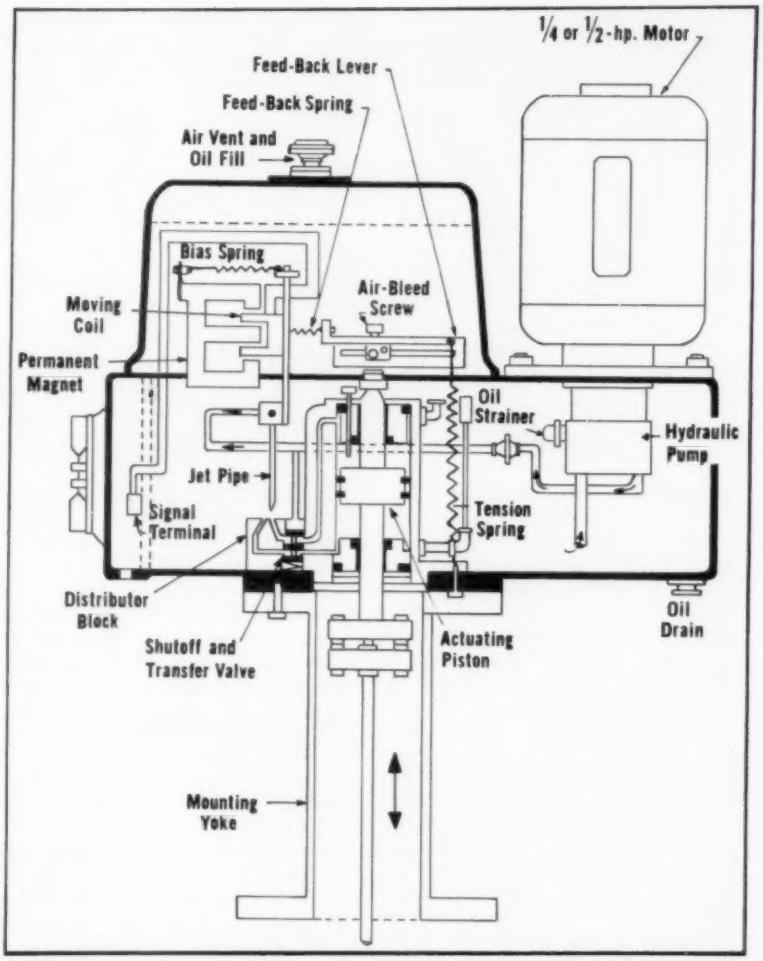
Power Supply

Power supply to the Regent refinery is by two 22,500-volt feeders, one operating, and one standby. They are equipped with automatic-transfer switch-gear in case of outage of the normal feeder.

Automatic restarting . . . Provision of electronic instrumentation on the FCCU, due to its high rate of response, has made feasible an automatic sequential restarting scheme which makes it possible to transfer main power feeders without transferring the entire refinery power load at one time and without interruption to the continuity of operation of the unit.

After a momentary power outage such as would be the case in the event of feeder transfer, the process-pump drivers remain connected to the line by virtue of time-delay relays on starter undervoltage dropouts.

However, the main air-blower and gas-compressor motors are disconnected from the line on instantaneous undervoltage, for a period of sufficient duration to allow the process pumps to reaccelerate and resume drawing normal current. The gas compressors, which are unloaded by valve lifters automatically with failure of motor drivers, then automatically restart, accelerate to normal opreating speed, and are reloaded automatically. When this sequence is completed, the air blower, which has also been unloaded by automatic closure of the inlet guide vanes, restarts automatically, accelerates, and is reloaded.



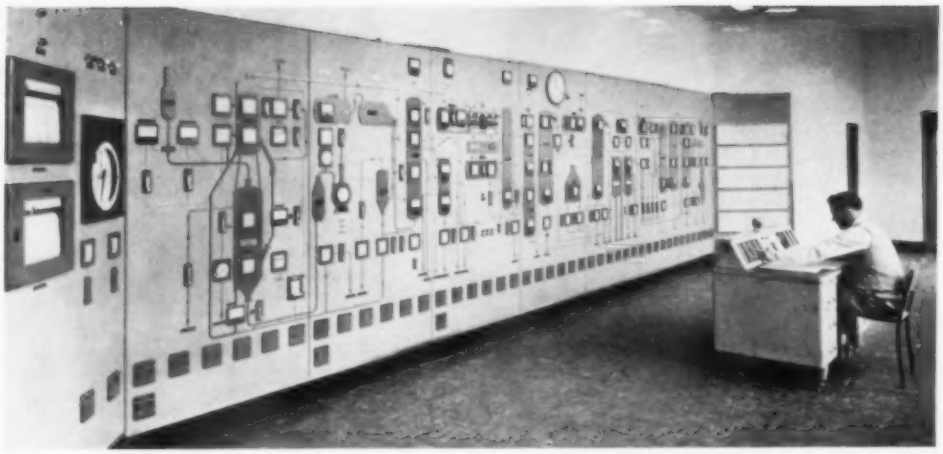
MOTOR-DRIVEN HYDRAULIC OIL PUMP delivers oil through pivoted jet tube. Deflection of tube is controled by 4-8 ma. output of controller. Depending on tube deflection, oil from jet tube goes to either of two orifices to feed one or the other side of power piston coupled to valve stem. Fig. 3.

Closure of the inlet guide vanes . . . This is effected by interruption of the signal output from a Swartwout electronic-flow controller in which case the Askania operator which directs the flow of oil to the power cylinder of the inlet guide vanes assume its emergency position. When the signal output is interrupted, it is transferred to a dummy load resistor so that the control remains in balance throughout the time the signal is disconnected from the receiving element. When it is reconnected, there is a minimum of hunting in the control before normal flow is restored. Experience with this system has shown that within 2 seconds of transferring the controller output to the Askania operator, the flow of air to the regenerator had completely stabilized.

Cat Cracker Controls

The regenerated slide-valve position is controlled by the reactor-temperature controller and the spent-cat slide-valve position is controlled by the reactor bed level.

Overriding differential-pressure controls . . . Both of these slide valves are equipped with overriding differential pressure controllers. These differential pressure controllers are set so that if the temperature control, or reactor bed-level control, requires the valve to open enough that the differential pressure would be lost (or if the differential pressure for any reason drops below a minimum set by the operator), the overriding control will take over the valve. And it will hold the valve in position such that there will be a differential pressure of, say 2 psi. across the valve, regardless of the requirement of the reactor temperature control or the reactor bed-level controller.



CAT CRACKER and main cat fractionator, gas recovery section, poly unit and other sections are all electronically controlled. Fig. 4.

Askania slide valve positioners . . . These are arranged so that a signal of 4 ma. the slide valves will be closed and at 8 ma. wide open. An override adapter is provided on the output line to the slide valve positioner which selects the lowest output of the two controllers, that is, the reactor temperature controller or the pressure differential controller. As long as the differential is above 2 psi. the output of the differential pressure controller will be 8 ma. and the selector will direct the output of the temperature controller to the slide valve. If the differential pressure falls to 2 psi., the output from this control will fall to below that of the reactor temperature control and the slide valve will be positioned by this instrument.

Smooth transition . . . This system has proven very reliable, and a transition from temperature or level control to differential-pressure control is much smoother than the standard operation where the operator would be required to swing his instrument to the manual position and control the valve manually, in which case he would invariably overshoot the valve position required to maintain differential and cause the unit to go into an unnecessary severe upset.

Air Blower Failure Shutdown

The FCCU is also provided with an automatic shutdown and steamout system actuated by failure of the main air blower. This has been effected by the use of signal-opening relays on the outputs of key controllers, that is, when the main air blower fails, a signal-opening relay opens the circuit on the output of the fresh-feed controller and shuts off the feed to the unit. At the same time other relays cut off the recycle to the reactor, open dispersion steam to the reactor riser, shut off torch oil to the regenerator, close the two slide valves, open the stack slide valves and release the reactor pressure to the flare.

High Sensitivity

Electronic controls are inherently possessed of much higher sensitivity in all components than pneumatic instruments. There is little if any mechanism in electronic control by comparison with pneumatic, and, since any mechanism involves some finite friction and consequent dead spot, it follows that electronic control should basically outperform pneumatic control equipment.

In straightforward terms, the sooner an upset is detected and action is taken to bring the condition back to normal, the smaller the off-normal valve will be and the shorter its duration will be. This has been reflected at Port Credit by extreme stable operation in all variables: that is, although the recording elements are set for high rates of response to process changes, the reactor temperature, slide-valve differentials, and flows throughout the unit exhibit a remarkable straight-line characteristic.

Temperature control . . . This is extremely important to quality and economy in all refinery cracking and distillation operations and particularly fluid cat cracking. With pneumatic controllers, rate action could never be used as intended to achieve close temperature control. In electronic instrumentation the most minute changes of temperature are transmitted immediately to the controller and through the control networks to the valves, and the signal to the valve is based on a true rate of change of temperature.

• This fact has definitely been reflected in the operation of the Regent FCCU by the reactor temperature controller which maintains set temperature within very narrow limits and will vary catalyst-circulation rates very rapidly and surely without upset of slide-valve differentials.

• For instance, on several occasions, recycle to the FCCU reactor, which makes up about 30% of the total charge, has been lost through loss of pump suction, high exhaust-steam pressure, etc. On these occasions, adjustment of catalyst flow down the regenerated-catalyst standpipe was so fast and smooth, that the operator did not detect loss of this large variable in heat balance either through change in reactor temperature or change in regenerated-catalyst slide-valve differential pressure.

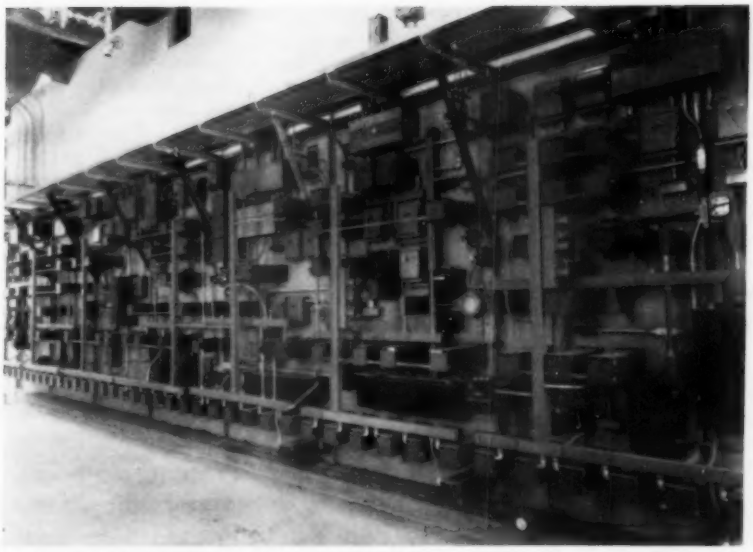
Furthermore, the spent-catalyst slide valve which controls the reactor bed level found its new position so quickly that no change could be noted on the reactor bed level or spent-catalyst slide-valve differential. The difficulty in all cases was recognized only after seeing that the recycle-flow recorder had fallen to zero or that the regenerator was out of heat balance.

High Response Speed

A very high speed of response is another unique feature of electronic controls. When compared with the speed that an electrical measurement or control signal travels, (186,000 miles per second), the pneumatic signal must certainly be second best.

Remote transmission . . . In a very large percentage of applications in a refinery, advantages of this transmission speed are not apparent, but it does offer a tremendous improvement in the control and applications involving transmission runs of 500 ft. or more.

For instance, on loss of the main fractionator reflux pump, the signal is immediately transmitted to the control house and the operator can take



CHECKING OF SYSTEMS is facilitated by plug-in meters. Also, components can be plugged in or out, making substitution of components possible. When the reactor temperature recorder failed, a nonessential poly unit flow recorder was plugged in and record maintained. Fig. 5.

steps to start the spare pump. When the spare pump is started, no longer do you hear the cry, "Put her on manual and catch her." The instrument is left on automatic, the pump swung onto the line and, in a matter of seconds, the top temperature and flow have stabilized.

Manual to automatic . . . In trial runs, to demonstrate to operators that electronic control could always outperform manual operation (a fact difficult to prove to some operators on a pneumatic system where there is inertia in the system), the main air blower, a 4,500-hp. unit, controlled by inlet guide vane position, was operated on manual to hold a chart reading of 2 units of air flow. The set point of the instrument was set at a chart reading of 7 and the instrument was flipped to the automatic position. In less than 1 second the flow had stabilized at 7 on the chart. A challenge to duplicate this "on manual" found no takers.

Plug-In Features

Electronic instrumentation lends itself to rapid checking by plug-in meters and substitution of plug-in components. In this manner the equipment is very easy to calibrate and provides much greater in-service accuracy. This feature has also been utilized at Port Credit when a vital instrument, such as the reactor-temperature recorder, failed. A nonessential-flow recorder from the Poly Unit board was pulled out and plugged in by the operator who once again had his vital record without having to look and wait for an instrument mechanic, even for precious minutes.

Electronic Instrumentation Cost

The cost of electronic controls approximately equals that of pneumatic control equipment, that is the cost of all components of the control loop of electronic equipment approximately equals the cost of all components of the pneumatic loop. There may be some variation up or down in favor of either system depending upon the particular variable involved.

- Electronic control equipment is much lower in price where temperature control is concerned if instrumentation is to be mounted on console or graphic-type panels. In fact, on any measurement which must be made initially by electrical means, the use of electronic control equipment for the balance of the components results in a system which is usually more economical.
- In general, flow control is about equal in cost, whereas pressure control favors the pneumatic system somewhat.

Installation cost . . . It is felt that electronic control can be installed more economically than pneumatic control. This is particularly true where Division 2 electrical codes can be followed, as was the case at Regent. Electrical wire is far less cumbersome than pneumatic tubing since all transmitter and controller signal leads for electronic equipment may be 22-gage wire and a 1-in.-diameter conduit will carry 50 leads.

No accurate figures are available to me, but it has been stated that a well-planned electrical panel board can represent a saving of 10% in fabrication cost over a pneumatic panel board.

In maintenance, we have an investment of $135,000 in instruments and, to February 1st of this year, we had spent $550 on replacement parts. Fig. 5 illustrates the simplicity and interchangeability of connection.

Power Surge Difficulties

Some difficulty was encountered early in the operation of the Port Credit Unit when the power company adjusted to load by switching capacitors in and out of the line. At these times, power surges, probably in the form of frequency fluctuations, came through to the capacitor bank of the constant-voltage transformer which supplies the control-panel power. These fluctuations resulted in momentary collapse of power to the instruments and caused considerable upset to the unit because, at voltage collapse, all valves assumed their emergency positions, i.e., the slide valves closed, stack valve opened, blower-inlet guide vanes closed, feed cut out, etc.

Unit shut down . . . This is probably one of the disadvantages of the high speed of response of the all-electronic control system for, although these voltage fluctuations were at worst of about 5-seconds duration, all of the valves had reached their final positions, and the unit had in effect shut down. In all cases, when power was restored, the instruments recovered the unit within a few minutes, except in one case where the blower-inlet guide vanes mechanically stuck at a position of about 20% open and the unit went into a severe upset.

Analysis of this upset later revealed that at all times the instruments functioned very well and accurately reported conditions throughout.

Power standby . . . As a result of these upsets it is proposed to install a motor-driven generator set coupled to a gasoline-driven engine. The board will normally be supplied with power from this set and, on power failure to the motor, the gasoline-engine clutch will engage, the engine will be cranked by a flywheel and the controls will receive essentially constant voltage. Experiments with one of these units has indicated a drop in voltage of only 3-4% and frequency drop of about 1 cycle in switching from motor to gasoling-engine drive. In our proposal, the hydroelectric power will spare the motor-driven generator set through automatic-transfer switches in case of failure of the unit.

The petrochemical industry is tough on materials. That's why engineers keep looking around for better

Materials of construction

In this article, the author reports on some of the trends, developments, and problems in materials application in the petrochemical industry today. Present materials limitations are in effect governing the rate at which many technological advances can be translated into new plants producing new petroleum chemicals.

BY EUGENE H. EDWARDS
Standard Oil Co. of California

A CONTINUING PROGRAM is required to explore new corrosion resistant alloys, and to assist in advancing fabrication techniques for metals of proven value, such as molybdenum, if the material needs of the petroleum industry are to be met.

Austenitic Stainless Steels

Austenitic stainless steels are certainly not newcomers to the oil industry. Today the austenitic stainless steels comprise the most important high alloy group used in refinery equipment. It has become a recognized practice to stress relieve welded austenitic equipment, usually at 1,550°-1,600° F., to lower residual stresses and minimize the danger of service failure from stress corrosion cracking.

For appplications up to 800° F.—and many of the petrochemical services are below this limit—the extra-low carbon grades are preferred to the stabilized types, principally because experience has shown they are less susceptible to crater cracking and microfissuring during welding. For services where the temperature exceeds about 800° F., and where intergranular attack is possible, the stabilized grades should be used, since it now appears certain that for long exposures in the sensitizing range, and particularly from 900°-1,000° F., the low carbon grades are capable of precipitating sufficient grain boundary carbides to become susceptible to intergranular corrosion.

Low carbon grades are substantially weaker at high temperatures than their regular carbon counterparts. To cite an example, the allowable stress for Type 316L plate at 800° F. is only about 50% of that permitted Type 316. At present, no minimum carbon content is specified for the regular carbon grades, and this has lead to a number of unfortunate incidents. Occasionally, regular carbon grades are produced with carbon content as low as 0.04%; such material has inferior high-temperature strength.

Abstract from paper presented at first welding, brazing, and heat-treating conference, sponsored by Golden Gate Chapter of American Society for Metals at Stanford Research Institute, Menlo Park, Calif.

High Nickel Alloys

The high nickel alloys, containing varying amounts of molybdenum, chromium, and silicon, should be mentioned here because of their increasing acceptance as construction materials for petrochemical equipment. One of this group, having approximately 30% molybdenum as the major alloying element, and marketed under the name "Hastelloy B," has been used extensively in plants where sulfuric acid, phosphoric acid and other mineral acids must be handled at intermediate temperatures. In the early days, welding of Hastelloy B presented a number of problems; hot, short cracking and nitrogen entrapment were prevalent, particularly in welding of castings. Most of those problems have been gradually eliminated, however, as a result of improvements in quality control, modifications of analysis, better electrode coatings, and increased welding know-how.

Two years ago Hastelloy B was accepted by the American Society of Mechanical Engineers as wrought material and forgings for use in unfired pressure vessels. In the past, containers of Hastelloy B have been constructed from solid plate, or from carbon steel with an attached alloy sheet lining.

Integrally clad Hastelloy B plate has been in the development stages for nearly 8 years, but only in the last year has the bonding become completely satisfactory. Integrally clad plate is available now from both Lukens Steel Co. and Chicago Bridge & Iron Co. Although these companies use different techniques to obtain a bond — Lukensclad is rolled, while C. B. & I.'s Hortonclad is vacuum-brazed—good adherence is obtained by both procedures, and the composite plate will undergo severe thermal treatment and mechanical forming without bond separation.

Refractory and Reactive Metals

Certain of the refractory and reactive metals have been undergoing evaluation because of their resistance to attack by mineral acids at high temperatures. Three of these—tantalum, molybdenum, and zirconium—are particularly attractive in this respect and are being used in chemical plants where the need exists and the equipment can be fabricated. Sulfuric acid is a case in point. Probably the most widely used acid in industry, it has been said that sulfuric acid has corroded more metal than all other acids combined. It is notably difficult to contain when the concentration is around the 50 to 60% level.

These three metals, molybdenum, tantalum, and zirconium, are useful in this service at temperatures several hundred degrees higher than the maximum at which the next best alloy is adequate. Although it has been indicated that tantalum has an acceptable corrosion note in 60% sulfuric acid as high as 500° F., in practice the service temperature should be lim-

ited to 375°-400° F. Above this range the tantalum becomes embrittled as a result of absorption of nascent hydrogen evolved during corrosion. It is probable that zirconium is also subject to hydrogen embrittlement, but the conditions under which it occurs are not well established.

Tantalum . . . In its commercial form tantalum is very ductile, lending itself readily to mechanical forming by all conventional methods. Unfortunately, tantalum reacts with most gases at high temperatures, and ductile welds are possible only if atmospheric gases are excluded from contact with the heated metal. At least three methods have been used to weld tantalum, viz: resistance welding under water, carbon arc welding under carbon tetrachloride, and inert gas—metal arc welding.

Good quality welds can be obtained consistently with the inert gas-metal arc technique, but only if an adequate gas shiled is possible. Where the weld is of simple geometry, the necessary degree of protection can sometimes be obtained by auxiliary local shielding supplementing the gas from the torch. Superior results, however, are possible if the welds are made in an inert-gas welding chamber in an atmosphere of helium. The quantity of atmospheric gases which can be tolerated in the chamber is much higher than for welding molybdenum; a preliminary evacuation of the welding chamber to 100 μ before flooding with welding-grade helium produces an acceptable atmosphere.

There is a continuing need in the petrochemical industry for pressure vessels with interior surfaces of tantalum. It is conceivable that a loose tantalum liner might be fabricated to fit inside a pressure vessel of simple geometry; as a matter of fact, several small pilot reactors have been constructed in this manner. But loose liners have several drawbacks including a tendency to collaps if the internal pressure temporarily drops below atmosphere. Although unattached liners are not suitable for large columns or vessels, they have been used successively in piping.

Pipe spools, ranging in diameter up to at least 4 in. have been fitted with loose liners of tantalum in thicknesses from 0.010 to 0.030 in. Fabrication of the liner is straightforward, and consists essentially of edge or projection welding tantalum flanges to a tantalum tube, which may be either seamless, or rolled up from sheet and butt-welded.

Tantalum jackets have been made from several types of instrument probes. These probes contain sensing elements required for operational control, and are inserted into a vessel via small flanged openings. One-inch diameter probes have been jacketed in lengths up to 5 ft.

"Certain of the refractory and reactive metals have been undergoing evaluation because of their resistance to attack by mineral acids at high temperatures. Three of these—tantalum, molybdenum, and zirconium—are particularly attractive in this respect and are being used in chemical plants where the need exists and the equipment can be fabricated . . . These three metals—molybdenum, tantalum, and zirconium, are useful in this service at temperatures several hundred degrees higher than the maximum at which the next-best alloy is adequate."

Molybdenum . . . Interest in molybdenum for petrochemical applications was strongly stimulated by the advent of grades made in electric furnace under vacuum. Utilization, however, has come more slowly than originally anticipated, in part due to a reluctance to use a material which sometimes lacks adequate room-temperature toughness, but primarily because of molybdenum's welding characteristics. Even when welding is accomplished under close control in an inert-atmosphere chamber to prevent embrittlement by oxygen or nitrogen, the welds rarely have the degree of ductility at room temperature which would be required for process equipment.

It is not unlikely that in the foreseeable future molybdenum of higher purity will become available, and these problems may cease to be of serious consequence. For the moment, however, molybdnum has been restricted to equipment which can be fabricated without welding, either by spinning sheet or by machining plate and bar stock. Mechanical seals have been used where conventional practice would specify welds.

One interesting molybdenum application is for valves. Although the molybdenum valves are only nearing completion and have not been tested in service, they are noteworthy because it is believed they represent the first valves to be made of this metal. They are designed as 2-in. gate valves, with forged body, bonnet, and flanges. No welding was required in fabrication.

At least three suppliers can now furnish molybdenum or molybdenum-clad tubing, and considerable thought has been given to its use as pipe lining and in heat exchangers. Designs are in preparation for reboilers using molybdenum tubes and molybdenum-clad tube sheets.

Zirconium . . . Of the three metals tantalum, molybdenum, and zirconium, far less is known of the performance and limitations of zirconium under conditions of plant operation than either of the other two. This is true chiefly because only recently has its availability become certain enough for nongovernmental agencies to consider its use in plant equipment. Generally speaking, the corrosion resistance of zirconium is inferior to that of either tantalum or molybdenum, but superior in many media to the nickel-molybdenum alloys. Zirconium is attractive for some installations as an economical substitute for either tantalum or molybdenum; the cost per unit volume of commercial-grade zirconium is only a little more than one-tenth that of tantalum, and the indications are that its price will decrease in the future.

The great variety of components suitable for process equipment that can be made from zirconium is evident in the excellent development work accomplished at the Bureau of Mine's Northwest Electrodevelopment Laboratory.

Lined reactors, agitators, exhaust fans, thermowells, needle and globe valves, pipe fittings, etc., were constructed of zirconium using standard equipment and following conventional practices. Although the early welding studies of zirconium were conducted under rigid atmosphere control in an inert-gas-welding chamber, it has recently been demonstrated that good quality corrosion-resistant welds can be obtained in the zirconium-2% tin alloy without the use of a welding chamber. It is believed that zirconium is presently being used in petrochemical equipment only on a test basis as components in sulfuric acid heaters, and in the form of liners for pipe spools handling sulfuric acid and hydrocarbons. Zirconium process equipment such as reaction kettles, heat exchangers, thermowells and valves are now appearing on the market and all indications point to a vastly increased usage of zirconium in the immediate future.

Combustion-air conditioning: —a passing fad?

BY W. R. CROOKS
Cooper-Bessemer Corp.

COMBUSTION-AIR conditioning is not a passing fad but a necessity on engines for higher specific output and low fuel consumption which we have learned to consider standard.

This article evaluates the place of combustion-air conditioning in the production of power with particular reference to the use of natural gas as fuel in internal-combustion engines.

Power requirements have increased in present gas-transmission systems. They have almost doubled with the advent of the 30-in. transmission piping and higher pressures. Lower compression ratios across compressor stations, and closer spacing of stations have made larger compressor units feasible.

Fig. 1 shows the trend for station costs as the horsepower of the units increases. In this specific study, using the medium-sized engine, a 10,000-hp. compressor station today costs $66 less per horsepower than if it were powered with the 1947 model engine.

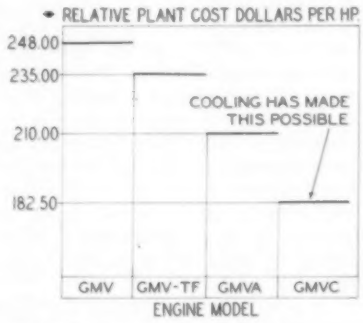
Increased productivity per man, through equipment having increased specific output and larger engines and compressors, has enabled the gas industry to absorb a great portion of the rising costs. Therefore natural gas is one of our lowest-cost commodities.

Presented at short course in gas technology, Texas College of Arts and Industries, Kingsville, Tex.

The Author . . .

W. R. CROOKS

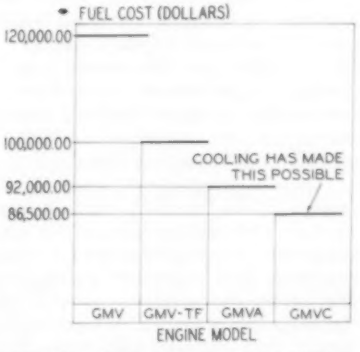
W. R. CROOKS is chief engineer of the development division of Cooper-Bessemer Corp. Since 1923 he has been associated with the development, field performance, and manufacturing operations of large heavy-duty diesel and gas engines of both the two and four-stroke cycle type. He has a number of patents, one of which gives rather broad coverage on combustion air conditioning. He has been a pioneer in the field of increasing specific continuous output and the thermal efficiency of internal-combustion prime movers.



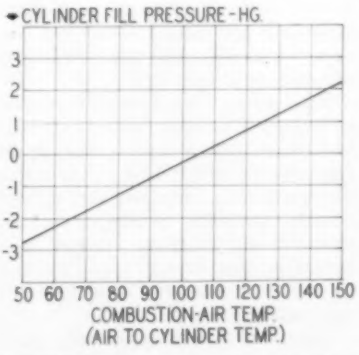
RELATIVE COST of 10,000-hp. compressor station vs. engine models. Fig. 1.

Fuel costs are more significant than formerly. The distance from the gas field to the market has greatly increased. The field gas costs have gone up roughly four times, from 5 to 25 cents per M.c.f. with very little increase in the retail price.

Fig. 2 shows what has been happening to fuel cost per horsepower-



ANNUAL FUEL COST of 10,000-hp. plant at full-load economy, using 15 cents per M.c.f. fuel cost, vs. engine models. Fig. 2.



CYLINDER fill pressure vs. combustion-air temperature. Fig. 3.

has this to say:

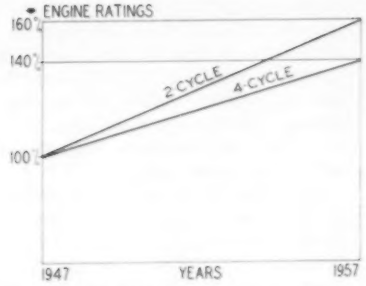
OUR EXPERIENCE in the gas industry is quite broad. We manufacture two and four-stroke-cycle gas and diesel engines, expander engines, turbochargers, and reciprocating and centrifugal compressors. The largest user of gas engines is the gas industry itself. Our engine-compressor combinations are used in three broad areas of the gas and oil industry:

1. Wellhead pickup compressors, where the pressure varies from below atmosphere to almost line pressure.

2. Main-line transmission, where the volumes are very large and the compression ratios rather low. Two different types of compressors fit this application.

- The centrifugal compressor, which is exceptionally well adapted to large units and low ratios. We made a very comprehensive economic survey and found that, in general, main-line centrifugal compressor stations were more economical than reciprocating compressor stations where compression ratios were less than 1.35 : 1.
- The reciprocating compressor, which covers an extremely wide range of flows, pressure conditions, and compression ratios.

3. Process industry—perhaps better known as the petrochemical industry. Here, again, the equipment is designed and manufactured to do a specific job. The pressures vary from low pressures for centrifugal compressors, up to 16,000 psi. for displacement compressors.



ENGINE RATINGS vs. years. Fig. 4.

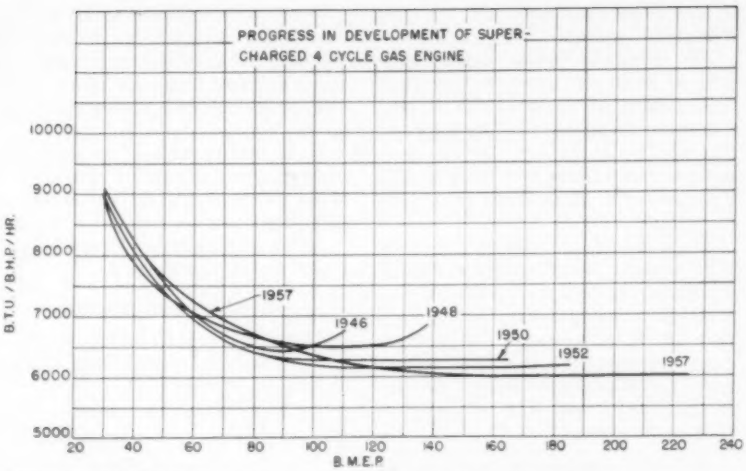
hour as the size and specific outputs of the engines have increased. The same engines that reduced the capital costs $66 per horsepower per station also have a $33,500 lower annual fuel cost. To produce a horsepower-hour our latest engines use only 60 to 70% of the fuel that they were using only 12 years ago. To put it another way, each unit of gas used for power in our latest engines produces 45 to 75% more than the best engine 12 years ago.

Specific output of engines has increased by 40 to 60% during the last 12 years. The general increase in specific engine rating between 1947 and 1957 is shown in Fig. 4. This increase is largely the result of three important developments, which are:

- Learning how to burn gas in engines having higher compression. Pressures in common use in gas engines between 1910 and 1947 were in the 80 to 135-psig. range. Since 1947 the compression pressures on the higher specific output and lower specific fuel-consumption engines have been in the 250-psi. range for two-cycle engines and up to 600 psi. for four-cycle supercharged gas engines at rated load.
- Turbocharging of gas engines. This increased the specific output by 30 to 100%.
- Cooling of combustion air. This is a necessity to increase the specific output and to obtain the better fuel consumption we associate with present-day engines.

The temperature of the combustion air has tended to increase as the specific output has increased. High-specific-output engines all have the cylinders pressure-charged by mechanically driven compressors, turbochargers, or a combination of both. Fig. 5 gives the trend of the increase in combustion air before cooling from 1947 to 1957. The temperature increases range from 30° to 130° F.

If combustion air density were the only thing affected by higher combustion air temperatures this could be compensated for by charging the cylinder to a higher pressure level. The cost of the increased compression could be balanced against the cost of cooling.

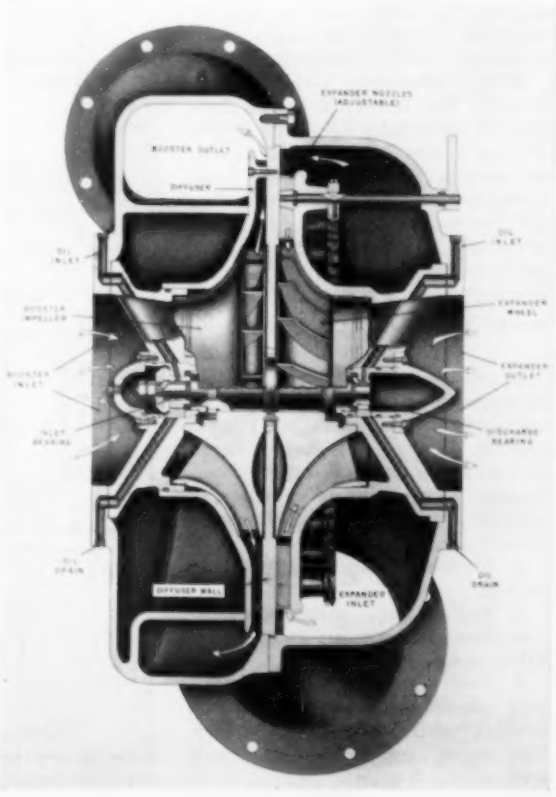


TREND OF INCREASE in combustion air before cooling. Fig. 5.

Constant air density is not the entire answer. There seems to be what I choose to call a critical combustion air temperature above which the engine will detonate at rated load regardless of the fuel-air ratio. When this critical condition causing detonation is reached in any given engine, with a given fuel, load level, and air temperature, there are only two things that will stop detonation.

The load must be reduced—this will permit higher temperature before detonation will again show up—or the air must be cooled. More density, or pounds of the same temperature air will not stop the detonation.

A large number of tests have been run to determine the critical air temperature versus loads. At higher combustion air temperature the detonating load limit will be decreased approximately 3½% for each 10° F. increase



CROSS-SECTION of Model AT-18 Turbocooler. Fig. 6.

in air temperature for both two and four-cycle engines.

The four-cycle turbocharged engine deviates from this uniformity in detonation limit at about 130° F. and a decrease in combustion air temperature of 10° F. in the 100° F. temperature range, down to at least 60° F., raises the detonation load limit by roughly 10%.

These trends are clearly shown in Figs. 16 and 20 where the manifold-air temperature is plotted against percentage rating. Cooling of combustion air is a necessity for gas engines operating at higher specific outputs, say above 82 b.m.e.p. on two-cycle engines and 115 b.m.e.p. on four-cycle engines.

Cooler combustion air improves the specific fuel consumption in at least three ways in engines with high specific output.

- It permits higher specific rating by raising the detonating load limit with almost constant mechanical friction and with consequently improved mechanical efficiency. With increased loading the specific fuel consumption will decrease, provided combustion efficiency is maintained.
- The cool scavenging air flushes the hot product of combustion from the cylinder clearance. The cooler charging air removes heat for the internal surfaces, thus lowering the heat of the cycle. Increased specific loading may be added until the heat of the cycle comes up to values established by years of operation.
- It permits higher combustion efficiency. The four-cycle higher compression supercharged gas engine operates on a very lean mixture. Cooler air permits the mixture to be made richer and burn more efficiently. The specific fuel consumption decreases at the rate of approximately 40 B.t.u. per b.hp.-hr. for each 10° F. reduction in the air temperature.

Where Combustion-Air Conditioning Helps

Combustion-air conditioning is not of equal importance in all types of engines and engine operation. The exceptions seem of enough importance to warrant some clarification. Combustion-air conditioning is not economically justifiable in the following cases:

1. Atmospheric two and four-cycle engines.
2. Turbocharged higher compression four-cycle engines rated below 110 b.m.e.p.
3. Low-compression, slow-speed, long-stroke turbocharged horizontal engines, rated at 90 to 100 b.m.e.p. This engine deserves detailed consideration.

Combustion-air conditioning is beneficial and essential to achieve the higher specific output and exceptionally good fuel economy now obtainable. Such engines and operating conditions are:

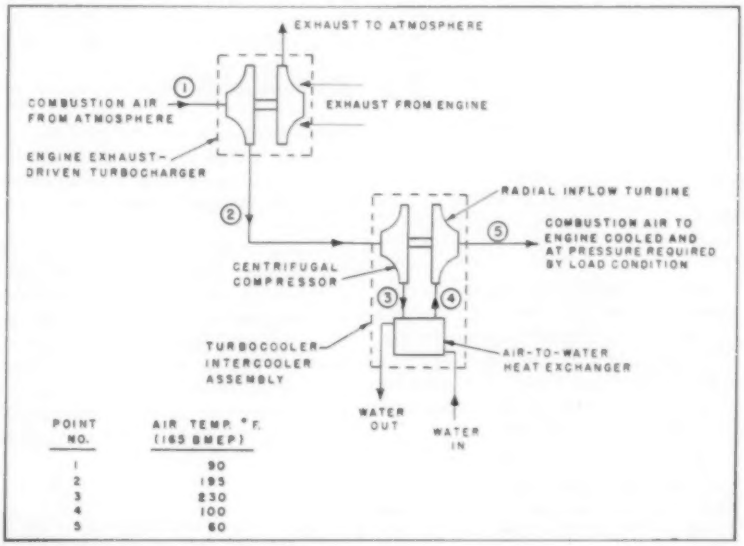
1. Supercharged medium and high-compression gas engines operating at above 90 b.m.e.p. on two-cycle engines, and 110 on four-cycle engines.
2. Supercharged diesel engines, generally above 125 b.m.e.p.

Effect on Temperatures

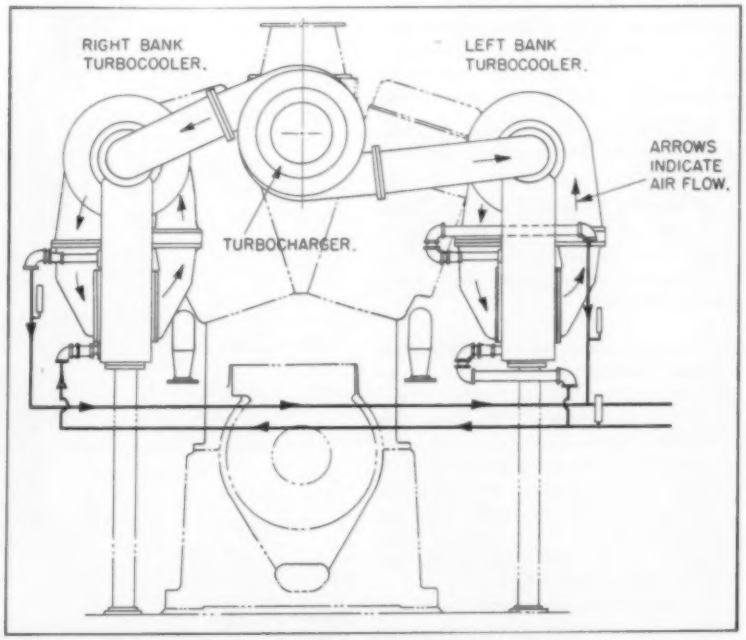
Turbocharging of existing horizontal gas engines has created wide interest as the horsepower is being increased 40% by so doing. It was thought that combustion-air conditioning would be extremely beneficial to help keep the internal cylinder surfaces from overheating when approximately 35% more fuel was burned in the cylinder due to increased load.

Combustion-air conditioning did not prove beneficial; neither did the cylinders overheat. Tests were made to determine the reasons for the divergence from anticipated results, and here is a summary of our findings:

1. The compression temperatures at the beginning of combustion are rela-



TURBOCOOLER cooling cycle. Fig. 7.



APPLICATION of Turbocooler to the LSV engine. Fig. 8.

tively low. The maximum temperature does not exceed 500° F. This is below the critical air temperature mentioned previously. Higher-compression-ratio engines, when the air is cooled the maximum amount, have compression temperatures of 625° F.

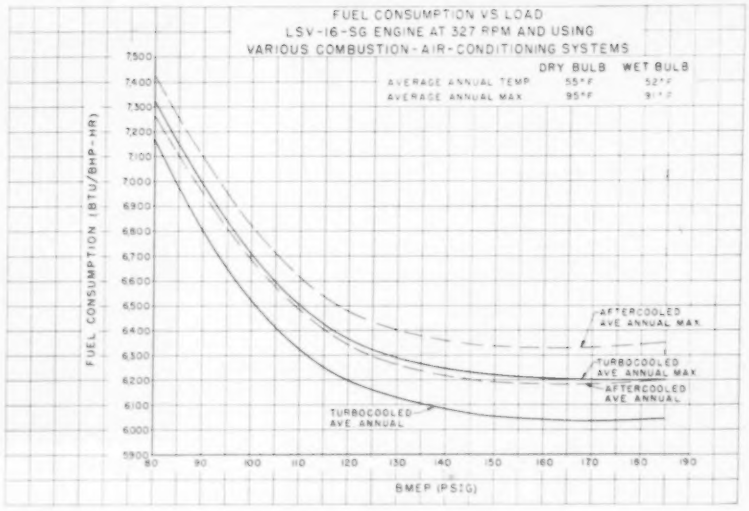
2. Lower compression ratios of 4.5 to 1 in the horizontal engines are less sensitive to detonation than present 11.5-to-1 ratio engines.

3. The lower specific outputs of these engines enable them to operate at higher air temperature without detonation.

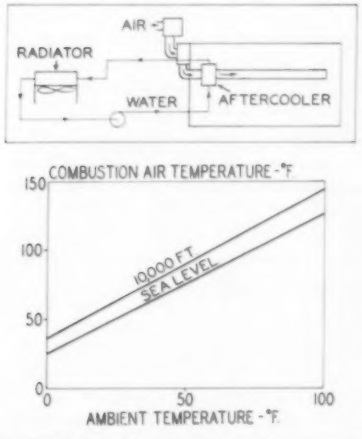
4. The lean mixture, plus extra air for scavenging the clearance volume, keeps the exhaust temperatures lower than they were originally expected. A 40% increase in load was carried with individual cylinder-exhaust temperatures of 915° F., when the oxygen content of the exhaust was around 8 to 9%.

Scavenging of the clearance volume in long-stroke horizontal engines is more thorough at higher combustion-air temperatures. The higher cylinder-charging pressure provides more energy in the system for scavenging.

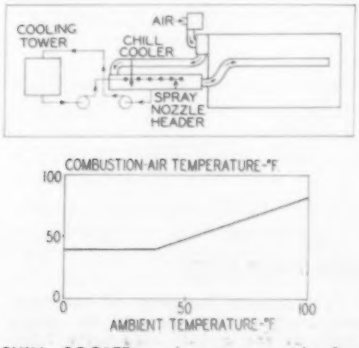
The temperature of the charge in the cylinder is the same whether it is more thoroughly scavenged by hotter air, or less thoroughly scavenged with cooler. Fig. 3 gives the charging pressure required for best combustion characteristic at different ambient temperatures.



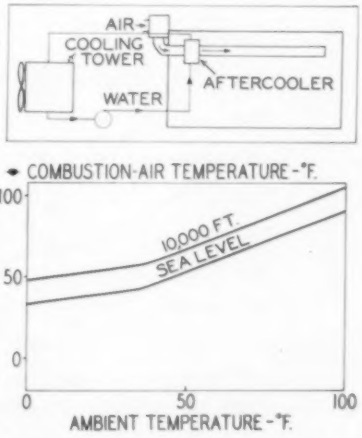
FUEL CONSUMPTION to turbocooled engine. Fig. 9.



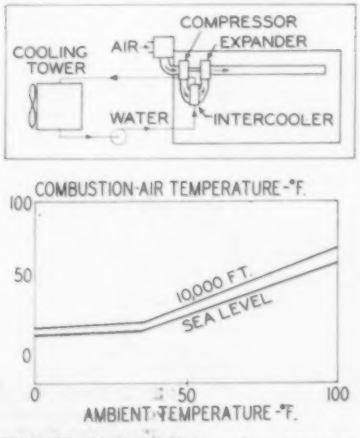
RADIATOR and aftercooler of two and four-stroke engines. Fig. 10.



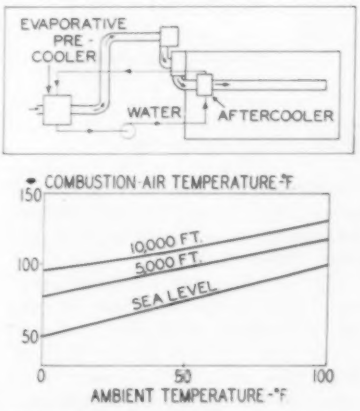
CHILL COOLER and pressure side for two and four-stroke engines. Fig. 13.



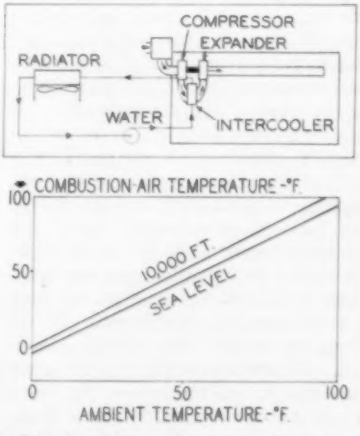
EVAPORATIVE TOWER and aftercooler for two and four-stroke engines. Fig. 11.



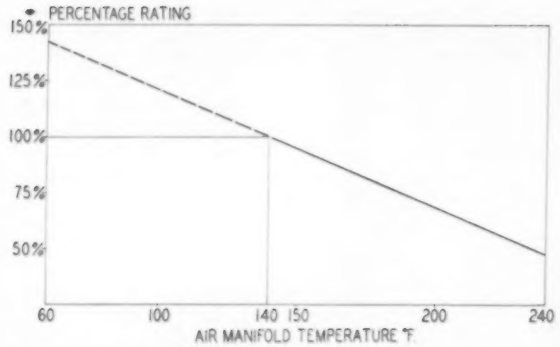
EVAPORATIVE TOWER and turbocooler for four-stroke engines. Fig. 14.



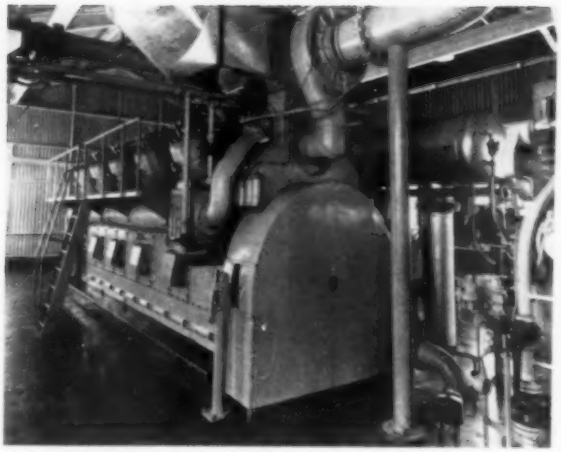
PRECOOLER aftercooler for two-stroke engines. Fig. 12.



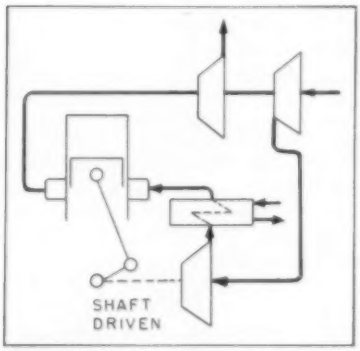
RADIATOR and turbocooler for four-stroke engines. Fig. 15.



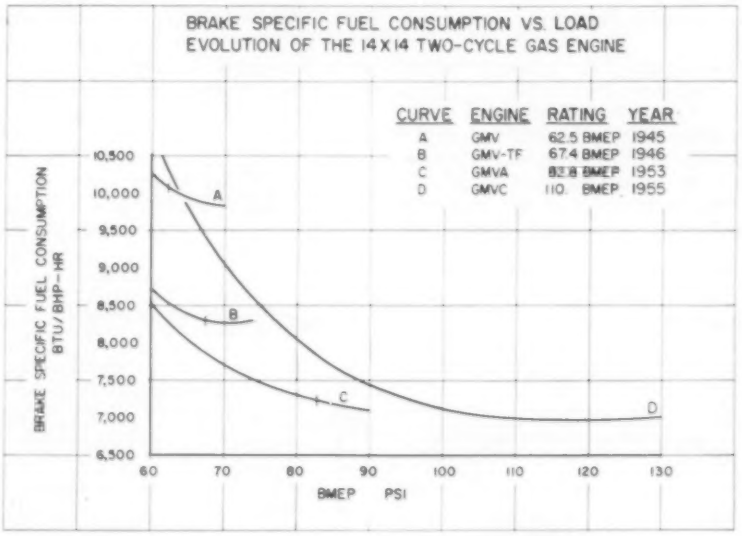
STANDARD RATING vs. air-manifold temperature for GMVC and GMWC engines operated to maintain 680° F. constant exhaust temperature. Fig. 16.



COOPER-BESSEMER model GMVC gas engine. Fig. 18.



SERIES turbocharging. Fig. 17.



FUEL VS. LOAD for turbocharged two-cycle engine. Fig. 19.

Calculations show that the density stayed constant in the cylinder throughout the entire change in ambient temperature.

Fig. 21 gives the engine-performance characteristics obtained throughout an ambient temperature range of 37° to 110° F. The exhaust temperature, fuel consumption, and firing pressures are practically independent of ambient temperature.

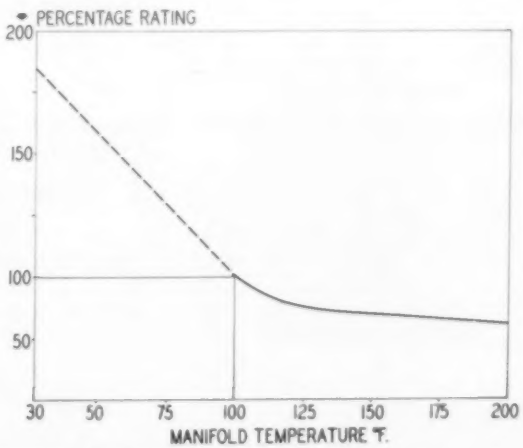
Fig. 22 gives the performance of the same engine operating with variable load.

How can we condition combustion air economically? There are several ways of doing this job, and the method should be selected that gives the best over-all results. A brief review of some of the various systems follows:

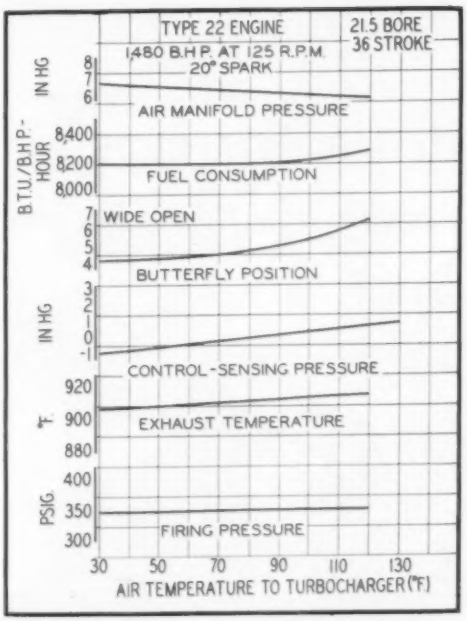
1. An evaporative cooler in the induction system of an engine. This is not too effective in a pressure-charged engine, as pressure charging, due to the heat of compression, raises the air temperature from 50° to 175° F. depending on type of engine and operating condition. This system will cool a maximum of approximately 25° F. from the highest temperature.

2. An aftercooler between the pressure charger and the engine. The aftercooler may be cooled by water from:

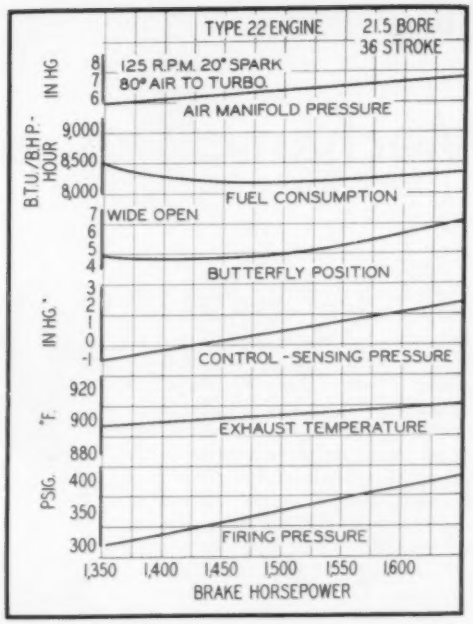
- A radiator, which gives a combination that cools the combustion air



PERCENTAGE RATING vs. manifold temperature for four-cycle supercharged gas engine rated to give the same combustion characteristics as for a full load with 100° manifold temperature and 6,250 B.t.u. per hp. per hour fuel consumption. Fig. 20.



ENGINE-PERFORMANCE characteristics obtained throughout an ambient temperature range of 37° to 110° F. Fig. 21.



PERFORMANCE of same engine as in Fig. 21, operating with variable load. Fig. 22.

to ambient plus 35° F. A sketch of this system is shown in Fig. 10.

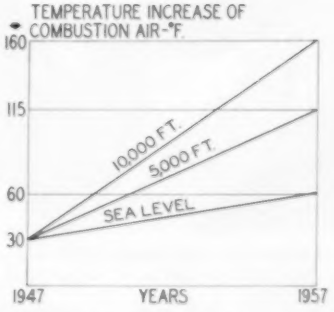
● An evaporative cooler supplying water to the aftercooler. Under maximum temperature conditions this system normally cools the combustion air to ambient minus 5° F. A sketch of this system is shown in Fig. 11.

3. A precooler-aftercooler combination is another type of cooling system. This is a relatively simple system with the precooler in the induction system. The aftercooler is located between the pressure charger and the engine cylinders. The precooler cools and humidifies the air, and in the process provides cool water that collects in the sump of the precooler.

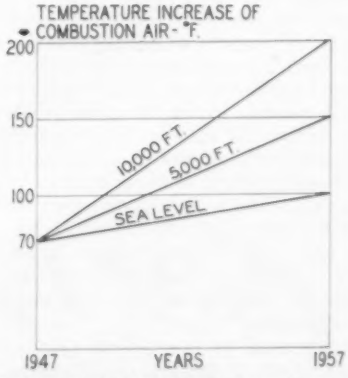
The water from the sump is used as a source of water for the aftercooler, and then returned and sprayed into the top of the precooler. Under high ambient conditions this system normally cools the combustion air to ambient temperature.

The water usage in this system normally has a maximum rate of evaporation and overflow—to reduce the concentration of solids in the water—of 0.3 lb. per hp.-hr. Such a system is shown in Fig. 12.

4. A chill-cooler system. This is a modification of an evaporative cooler located between the compressor and the engine. Water in this cooler does not cool by evaporation in the chill cooler but by direct water contact. The heat from the air is dissipated from the chill cooler by means of an atmospheric evaporation cooler. This will cool the combustion air to approximately ambient minus 15° under high ambient conditions such as 75 wet bulb, 100 dry bulb.



TEMPERATURE INCREASE of combustion air (before cooler) vs. years, for two-cycle engine. Fig. 23.



TEMPERATURE INCREASE of combustion air (before cooler) vs. years, for four-cycle engine turbocharged. Fig. 24.

5. Turbocooling system for cooling combustion air. This system is an extremely simple air-refrigerating system, with some of the heat of compression from the turbocharger and turbocooler being carried away by a conventional aftercooler.

The energy for refrigeration is provided by the turbocharger, which delivers air at a higher pressure than necessary for combustion. The energy obtained from the expander wheel drives a compressor, and the air in doing work when passing through expander wheel reduces the temperature by approximately 40° F.

This system is essentially a very simple air-refrigeration system in which the surplus energy from the turbocharger is used to provide the air-expansion refrigeration. Under high ambient temperature encountered in the Southwest this system will cool the combustion air to approximately 50° F. below ambient temperature.

Water from an evaporative cooler is used to supply the turbo-aftercooler. If the external radiator is used to cool the aftercooler, the combustion air temperature will be 5° F. below ambient temperature.

If an external radiator were used to cool the aftercooler water during weather below freezing and an evaporative cooler used to provide cooling water in the summertime, optimum performance could be obtained through the year. The engines on one gas line are so equipped.

Mechanical vs. electric drive for rigs

—Here's how they compare

BY W. P. STEPHENS AND A. H. CANDEE

LONG USE shows that direct drive from the engines of a drilling rig to the draw works and to the slush pumps is a practical method of transmitting power. However, there are a number of characteristics which could well be improved. Now, the almost complete dieselization of the American railroads within the past 20 years has produced new high-power, lightweight electric generators and motors. These can be adapted without difficulty for oil-well-drilling purposes.

This article examines the rig drive to show how these two drives compare.

Multiple engines . . . The first law by which the oil-well driller selects equipment and method of operation is that he shall continuously guard against power failure to the hoist and the slush pumps. For, if all power is lost for any length of time, the hole may be lost. As insurance, then, he usually insists upon a multiple number of engines, also a multiple number of slush pumps.

This is good up to a certain point, but can easily be carried to extremes. Suppose, for instance, that a rig needs 1,200 engine horsepower. This can be provided in two, three, four, or six engines. If the average down time (at normal rate of expectancy) is one shutdown per (X) engine operating hours, then:

(a) For 2 600-hp. engines—2 shutdowns per (X) hours.

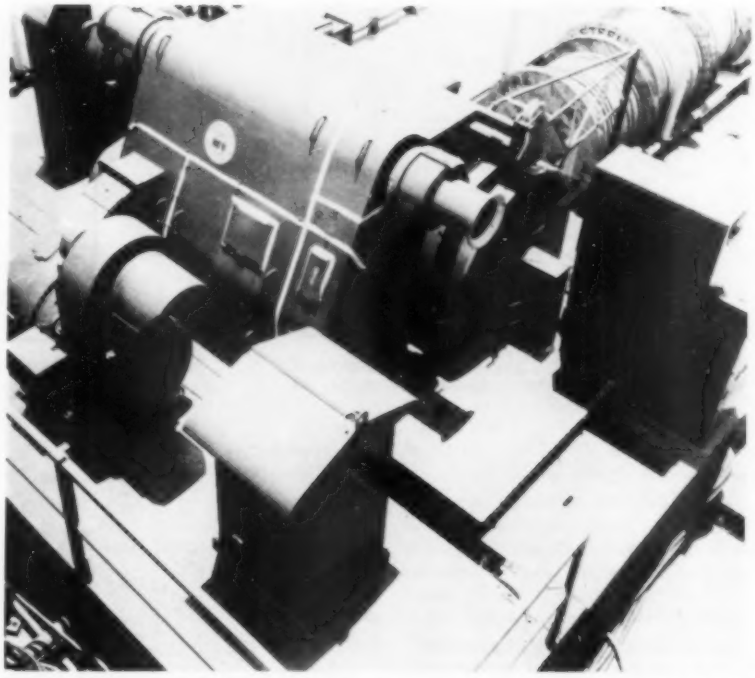
(b) For 3 400-hp. engines—3 shutdowns per (X) hours or 150% of (a).

(c) For 4 300-hp. engines—4 shutdowns per (X) hours or 200% of (a).

(d) For 6 200-hp. engines—6 shutdowns per (X) hours or 300% of (a).

As a matter of fact, many of the smaller, higher speed engines have a higher failure factor than for the slower and more substantially designed engines. This means that the indiscriminate multiplication of the number of engines used may lead to more possibilities of power failure than if a minimum number is used.

Authors are with White Motor Co., Springfield, Ohio. Paper presented at AIEE petroleum electrical conference, Dallas, 1958.



SINGLE-MOTOR ARRANGEMENT is used for medium-sized draw works. Rectifier for motor circuit is in foreground, skidded with motor.

More parts, more failures . . . An increase in the number of parts used to do any job generally carries with it a correspondingly increased probability of failure. This applies to the total number of cylinders built into a group of engines, as well as to the number of engines. Thus, the two engines of Line (a) in the table above can be built with a total of 12 cylinders (6 cylinders in each engine), while the engines of Line (d) would undoubtedly use a minimum of 36 cylinders. With the six engines of Line (d) there are three times as many cylinders, pistons, rings, valves, rocker arms, and other such parts, each a possible source of trouble and a definite obligation in maintenance.

This means that a minimum number of engines and parts is desirable to cut the probability of outages. However, we must decide the proportion of total power which must still be available when one engine is taken out of service for any reason. Normally the two-engine power plant is the most satisfactory if the engines are of the simple, long-life, medium-speed type. This arrangement results in half of the power remaining if one engine is shut down. The inconvenience of having but half power for that period is more than offset by the reduced frequency of such shutdowns. However, a three-engine power plant using this same type of medium-speed, reliable engine is still good planning and results in two-thirds of the power being still available with one engine out of service.

Use of more than three engines should be scrutinized carefully to be sure there is a definite need for so many.

Operating costs . . . Three main items make up operating costs. These are: (1) supplies such as fuel, lubricants, etc.; (2) maintenance expense such as

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WELL TYPE	WELL LOCATION	DAILY PRODUCTION			Frequency of Visco Treatment	Cost of Visco Treatment per bbl of produced fluid
		Oil bbls	Water bbls	Gas MCF		
Pumping	East Texas	40	300	—	3 times a week	.13¢
Pumping	Eastern Kansas	2	492	—	Once a week	.03¢
Flowing	West Texas	20	6.3	—	Twice a week	.22¢
Pumping	Northern Kansas	10	70	—	Once a day	.62¢
Gas Lift	West Texas	20	20	—	Once a day	2.8¢
Pumping	North Texas	—	2000	—	Once a day	.16¢
Pumping	Eastern Kansas	—	250	—	Twice a week	.11¢
Flowing	East Texas	51	155	1	Once a day	.28¢
Flowing	West Texas	420	—	—	Twice a week	.13¢
Gas	East Texas	25	Trace	22.9	Twice a week	4.6¢*
Pumping	West Texas	420	210	—	Every other day	.14¢
Pumping	West Texas	441	441	—	Every other day	.052¢
Gas	Northern La.	—	—	23.4	Once a day	2.42¢*
Pumping	Eastern Kansas	—	250	—	Once a day	.15¢
Pumping	Kansas	100	948	—	Twice a week	.13¢
Gas	Louisiana	9.2	Trace	300	2 Sticks every other day	.66¢*
Pumping	East Texas	46	176	0.92	Once a day	.27¢
Pumping	East Texas	51	155	1.0	Once a day	.28¢
Pumping	East Texas	20	400	—	Three times a week	.12¢
Pumping	Eastern Kansas	2.5	276	—	Once a week	.09¢

*Cost in cents per million cubic feet.

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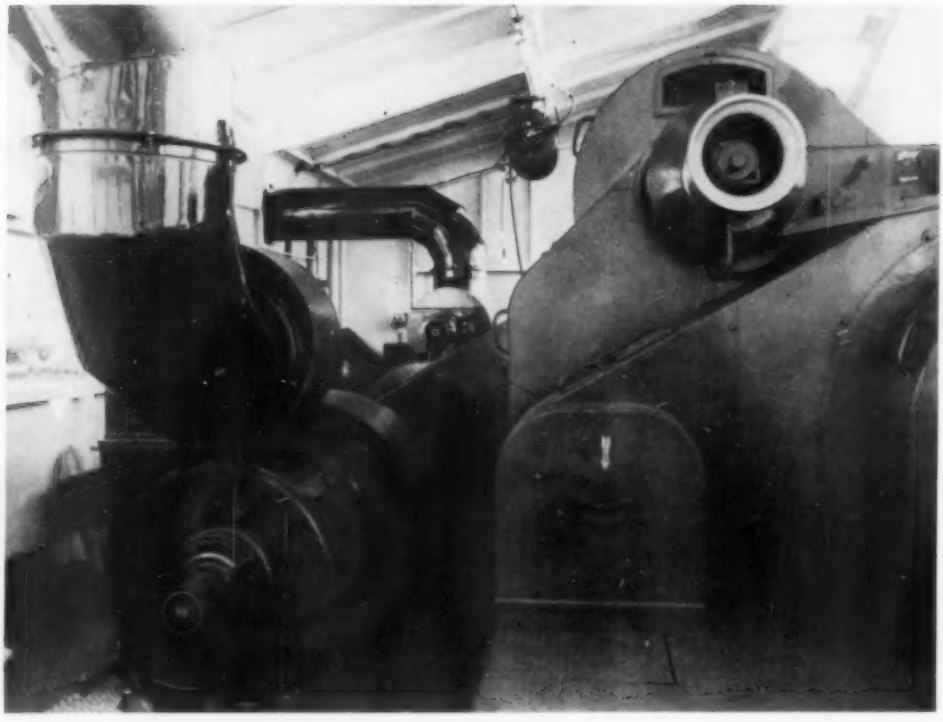


TWO-MOTOR drive arrangement insures ample power for 1,600-hp. draw works. Rated 1,250 intermittently, the motors are able to carry a 1,600-hp. peak load. Air intake for motor ventilation is outside draw works shed, a safety measure.

inspections, repair labor, parts costs; and (3) depreciation.

Supplies vary with the type and number of engines used. Most rig designers prefer engines in the medium-speed range that have proved reliability and proved fuel and lubricating-oil costs. They follow these same preferences in regard to maintenance costs where the medium-speed and substantial construction contribute to very favorable repair-expense records. Here is another place where it pays well to have a minimum number of engines and parts—engine frames, crankshafts, bearings, cylinder liners, pistons, rigs, valves, rocker arms, fuel pumps or carburetors, etc. Each individual piece is a maintenance item that must, at some time, be reconditioned or replaced.

Depreciation is an item of expense which is often neglected in considering the expense of drilling a well. Actually, in oil-well drilling where mechanical drive is used, engines are subjected to very severe treatment and the depreciation rate is usually high. Torque converters or fluid couplings have softened this severity.

A Look at Mechanical Drive Systems

Of all the rotary rigs of North America which are powered by combustion engines, approximately 99% employ a mechanical drive system for the transmission of power from the engines to the draw works, mud pumps, and rotary table. It has been found that the minimum installed engine power results when the engines of a rig are grouped together to drive a compound, from which are driven the draw works and the mud pumps. This arrangement means that the main engines must be located in proximity to the draw works and that the mud pumps must also be located close to the compound. Such a grouping, of course, usually results in crowding of equipment, limits the designer to a rather few equipment-arrangement patterns, and entails the use of an expensive substructure.

Variable torque . . . The main hoist of a draw works requires a torque which must be varied to correspond to the changing weight of the drill string. The combustion engine at full power is essentially a constant-speed, constant-torque prime mover, and variations from this maximum engine torque, speed, and horsepower can only be downward. The torque at the hoisting drum, however, may be multiplied to a value much higher than the engine torque by building several stepup ratios into the drive system. With a fixed maximum horsepower of engines, this means that when the torque at the hoisting drum is stepped up, the speed must be reduced correspondingly to stay within the limits of the power available, which is the total engine horsepower less the losses in the transmission.

It is obvious that the drive of a hoisting drum from a group of combustion engines must incorporate some system whereby any of a number of torque ratios may be selected. A straight mechanical drive with six fixed ratios and clutches can use full engine power at six definite speed-torque points only. Between these speeds somewhat reduced performance must be accepted. If some type of an automatic torque converter could be interposed, it should result in better performance between the speeds defined by the fixed ratios. This, then, gave rise to the use of hydraulic torque converters, each engine driving through such a converter into the compound. Such converters are automatic in action over a limited range and are effective additions to the drive system. When torque converters are used in this way, the number of selective drive ratios may be reduced to as low as two and with a probable maximum of four, thus effecting a corresponding reduction in the number of chains, sprockets, and clutches.

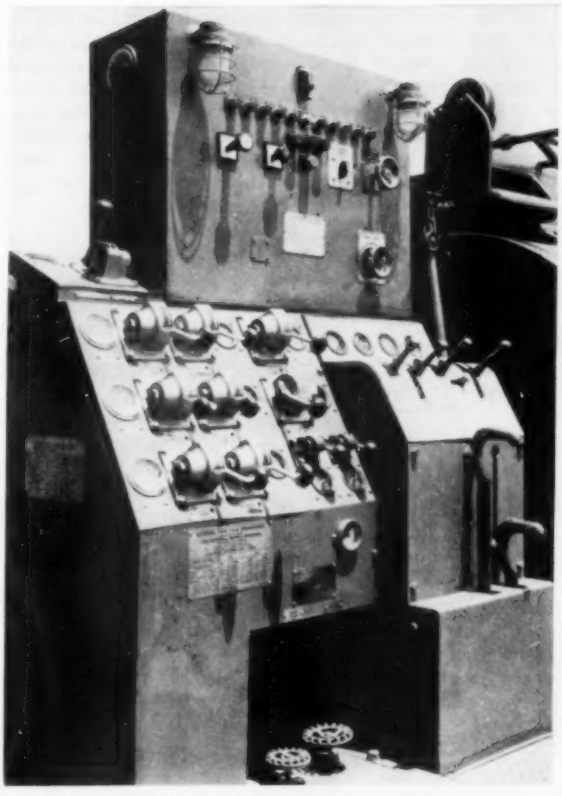
A Look at Electric Drive

Electric drive is, in reality, merely a method of developing power in one place and transmitting it by means of cables or wires to the point where it is to be used, at the same time introducing automatic selective torque multiplication. For oil-well drilling, the assembly usually consists of a

group of main drilling engines each driving one or more electric generators, and an electric motor mounted to drive each of the main pieces of machinery. Added to these generators and motors must be some electric control items so that flow of electric power to each motor may be varied and controlled according to the needs. Thus, a complete electric drive will sever all mechanical ties between the engines and the driven machinery, allowing full freedom for engine location as best suited to the rig layout. Furthermore, engine speed is not related in any way to the speed of this machinery, so that the engines may be operated at their most advantageous speed. The generators may be direct-driven (at engine speed) or geared up in speed, but the latter introduces extra mechanisms which require maintenance and involve additional operational hazards. The motors generally drive the apparatus which they power through a simple chain drive.

Direct current preferred . . . Electric energy may be generated in two forms —alternating current or direct current. For transmitting drilling power, d.c. is preferred because exact power and motor speed control is relatively simple with d.c. and is difficult with a.c. Electric power output of a d.c. generator can be controlled very easily merely by increasing or decreasing the strength of its magnetic fields. As a result, power delivered to a motor, and thus this motor's output, may also be controlled very simply by assigning a generator or a group of generators to feed this motor, then varying the relatively small current needed to create the generator's magnetic fields. If an a.c. transmission were used, the control of power flow would be far more complicated. As a matter of fact, everywhere in industry that smooth and positive variations of speed and torque are required over a wide range, d.c. transmission is preferred.

Electric power assignment . . . In a rotary rig, the power demands fluctuate throughout the drilling cycle. When drilling, the pumps may require large quantities of power, while the rotary table requires very little. When coming out of the hole, however, the power delivered to the draw works must be high, with little or no power to the pumps. This means, with electric transmission, that the electrical connections must be such that any preselected combination of generators (and thus engines) may feed any of the motors. The driller has control of this selection.



DRILLER'S electric-control panel is mounted conveniently above regular rig-control console.

There are times when part of the power of an engine may be needed for one purpose and part for another. This means that two separate generators must be driven by that engine. In fact, for most of the two-engine and three-engine drives, each engine drives two d.c. generators for drilling purposes. This allows the greatest flexibility in the assignment of power.

Series type motor . . . The greatest electrical capacity can be built into a given size of motor frame if the field is series wound. That is, the field winding is of the same current capacity as the motor armature and is normally excited by passing the armature current through this in series. However, the series motor is very hard to control; it has a tendency to speed up fast under light load and is therefore generally considered unsuitable for draw works drive. For that reason, most prefer a separate excitation of the motor's magnetic fields. One way to take advantage of the series motor capacity but obtain the stabilization of motor speed is to separately excite the motor fields from a fixed low voltage, high current-capacity rectifier, without moving parts. This rectifier takes power for excitation from the rig's a.c. power system and converts it to d.c. as needed for field excitation.

Circuits and apparatus . . . Power flow is controlled remotely through low voltage, small-current circuits. Usually there are small controllers at the driller's position on the derrick floor, one for each of the machines under his control. Manipulating a controller sets up control circuits to close the proper main contactors for power flow to that machine. Simultaneously, control-current flow in other circuits energizes the proper generator fields. The field is varied steplessly and exactly by the controller in proportion to the flow of main current desired and which corresponds to the motor torque and speed desired. If the driller wants to apply power to a slush pump, he simply operates that pump's controller; if he wants more torque and speed, he advances the controller and vice versa. A foot-operated controller is often used in parallel with the hand-operated one on the draw-works controller.

There are various ideas about where to obtain the control power. Some builders include extra generators for this purpose. Others feel that the simplest system results when this power is taken from the rig's alternating current supply and is converted to the necessary direct current by rectifiers.

In designing electric drive power packages for drilling rigs, it is necessary to try to avoid devices and cir-

cuits which might lead to trouble. For instance, each time that a main circuit is opened to shut off power, one or more of the main contactors opens. If this were to open under load, that is, when main electric power is flowing, a tremendously hot electric arc would be formed at the contact tips. Unless this arc is snuffed out immediately, it will burn them and possibly jump to adjacent parts and cause extensive damage. Some new contactors are fitted with positive magnetic blowout which reduces the probability of such failures to a minimum. Even the very maximum load ever carried may be opened time after time without distress.

It is a good policy to reduce the number of parts wherever possible if the operational safety of the rig is not jeopardized. This pays big dividends in the control system. Every moving part may fail at some time and every electric-contact-making device, particularly those of the low-current-control circuits, may not make contact if dirt or foreign material lodges on a contact surface of the device.

Advantages of Electric Drives

Oil-well drilling through the medium of an electric transmission has many definite advantages over mechanical transmissions. Some salient features are:

Location of machinery . . . With electric drive it is no longer necessary for the engines to be grouped together on an expensive platform adjacent to the derrick floor. Neither do the engines have to be rigidly grouped and lined up as when driving into a compound. Likewise electrically driven slush pumps are given a new freedom of location, which the designer may then use to reduce rig expense. As far as the draw works is concerned, it is also released from a fixed position on the derrick floor and may even be placed on a different level if more practical and convenient.

Mechanical shocks reduced . . . Mechanical shocks, transmitted backward through a mechanical-drive system, contribute to high engine and draw works repair costs. While hydraulic torque converters or fluid couplings alleviate this condition, these items are expensive. With electric drive, such mechanical shocks are entirely eliminated without additional cost, thus insuring better engine and machinery performance.

Full torque at standstill . . . The d.c. electric motor has one inherent characteristic which has been cherished by operators of steam rigs. This is that it can exert full torque at standstill and at low speeds. In fact, if the motor is properly applied, it can exert a much greater torque as compared to normal values than can the steam engine. This means smoother and faster starts when hoisting.

Stepless torque variation . . . Electric drive is actually a very effective torque conversion system with relatively high efficiency throughout a wide range of speed-power values. The change from one to another speed-torque ratio is automatic and stepless, thus providing extremely smooth control of power flow.

Control is simple, exact . . . The control of electric power flow is very simple and is exact. This control is exercised remotely through the medium of low voltage, low-current-control circuits. The controllers are small and they are easily operated by the driller.

Lower operating costs . . . Over-all operating costs, which include fuel, lubricants, other supplies, supervision, maintenance expense, and depreciation are low for electrically operated rigs. Transmission efficiency is high, and the absence of mechanical-transmission stresses strongly favors reduction in down time (delays are always expensive when drilling), in repair expense, and depreciation is much lower with reduced abuse.

The Semielectric Drive System

A recent combination of the electric and mechanical drive system makes use of some of the important advantages of the electric system yet retains some of the operating characteristics of the mechanical drive. This assembly is Dixilyn Drilling Corp.'s offshore barge, the Julie Ann.

The Julie Ann is powered by three diesel engines each developing 825 hp. at 900 r.p.m. Each engine drives one direct-coupled electric generator. These three engine-generator sets are mounted side by side and drive from an outboard shaft extension of each generator through a fluid coupling into a chain compound. This compound, in turn, may be coupled to drive two 1,000-hp. slush pumps. A 350-hp. mud-mixing pump is installed near the drilling engines and is electrically driven by a single motor. The draw works (designed specifically for electric drive) is mounted on the derrick floor, being driven by two motors. The rotary table is driven automatically from the draw works.

Operation . . . When drilling, it is customary to couple one of the main slush pumps to the compound. Pump speed is regulated either by throttling back the engines or by reducing the oil levels in the fluid couplings, which is wasteful of power. These adjustments are easily controlled by the driller.

One of the draw-works motors is connected to one of the main generators (or at times two motors may be connected to two generators) and the draw-works controller then advanced to give the desired rotary table speed. When hoisting, the main slush pumps are disconnected from the compound and either two or all three of the main generators then connected to supply power to the draw works. Hoisting power is then applied merely by manual control of the draw-works controller or by means of a foot treadle.

Control . . . Power to the draw-works motors and to the mud-mixing pump motor is controlled by the magnetic fields of the exciting generators (exciters) which furnish exciting field current for each main power generator. Thus, by varying the exciter field current up and down over a range of 1 to 5 amp., the main power flow up to 2,000 amp. or up to 900 volts is accomplished.

Direct-current control power for feeding the exciter fields (up to 5 amp.) is obtained in a very simple way. Alternating current from the rig's 60-cycle a.c. power system is fed to a 110-volt continuously variable voltage transformer (a variac) built as a part of the controller. Forward movement of the controller first closes the main circuit contactors according to the driller's preselected generator and motor combination, and connects the variac to the a.c. supply system. Continuing forward movement gradually increases the voltage which the controller arm picks off of the variac. This selected a.c. voltage is then rectified (changed to d.c. through a stack of special metal plates and having no moving parts) and is fed to the exciter fields.

Electrical Education

The use of any new industrial tool requires a certain degree of education in its use for the people who are to operate it. This is also true of electric drives. Electrical principles, devices, and circuits may be new, but they are not difficult to understand if properly presented. As use of electrical machinery becomes more general in the drilling industry, the fear and the distrust of things electrical will entirely disappear.

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REFINING

At Eastern States' Houston refinery . . .

Platformer expansion boosts capacity

by more than 50%

BY LARRY RESEN
Refining Editor

A CAPACITY INCREASE of more than 50% has been made as a result of a recent expansion of Eastern States Petroleum & Chemical Corp.'s U.O.P. Platforming unit.

Present reactor charge is rated at 11,500 bbl. per stream day compared to a preexpansion throughput of 7,500 bbl. Major changes involved the installation of gas-fired reboilers, a new reactor heater, larger preheat exchangers and reactor product coolers, extension of prefractionator, and revisions to reactor product fractionation.

These modifications are the latest round in a series of expansions to the unit at Eastern States' Houston refinery. Present capacity is better than 2½ times the original 4,500-bbl. capacity first installed in 1952. Additionally, a few minor changes are contemplated which will probably add another 600-bbl. capacity on top of the current figure.

Background . . . The Eastern States unit first went onstream with two 600-hp. hydrogen-recycle-gas compressors and the early type of reactors. These consisted of carbon-steel shells, lined with refractory. The first major change involved the addition of a third recycle-gas compressor. This was done in 1955 and followed by the installation of alloy lined reactors.

These were larger than the original ones and, with their addition contributing to a lowered space velocity through the reactor section, it was decided to further increase the charge rate. This was accompanied by the addition of a fourth compressor in 1956 to handle the additional gas load. Reactor charge had been increased to 7,500 bbl. at the end of these expansions.

This was the charge rate existing when the recent expansion was contemplated. This latest expansion was complicated by several factors generally resulting from the previous expansions. Pressure drop had become critical in the system, and the addition of a new compressor would have been of little use in upping throughput. Fractionation capacity was a limiting factor and had to be considered in any future expansion. Heating capacity was also a consideration.

Modifications . . . The biggest changes involved the substitution of gas-fired reboilers on towers in place of product and steam exchangers, plus the addition of a third reactor-charge heater. In the preexpansion days, the reactor charge leaving the prefractionator passed through an exchanger and then entered the primary heater prior to being charged to the first reactor in series (Fig. 1). The flow through the reactor section continued in usual series fashion, with the effluents from the first, second, and third reactors passing through separate sections of the secondary heater for reheating.

Effluent from the last fourth reactor in series was used as reboiler heating medium on the prefractionator as well as on the preheat exchanger to the prefractionator, before being watercooled and charged to the separator. Additionally, a sidestream from this effluent was used as reboiler heating medium on the stabilizer and then used to preheat reactor charge prior to the latter's entering the primary heater.

A differential pressure controller was also in this reactor-effluent slipstream which helped control the flow of effluent streams, but also added pressure drop to the system. The slipstream was then returned to the main effluent stream to be commingled prior to water cooling and entering the separator.

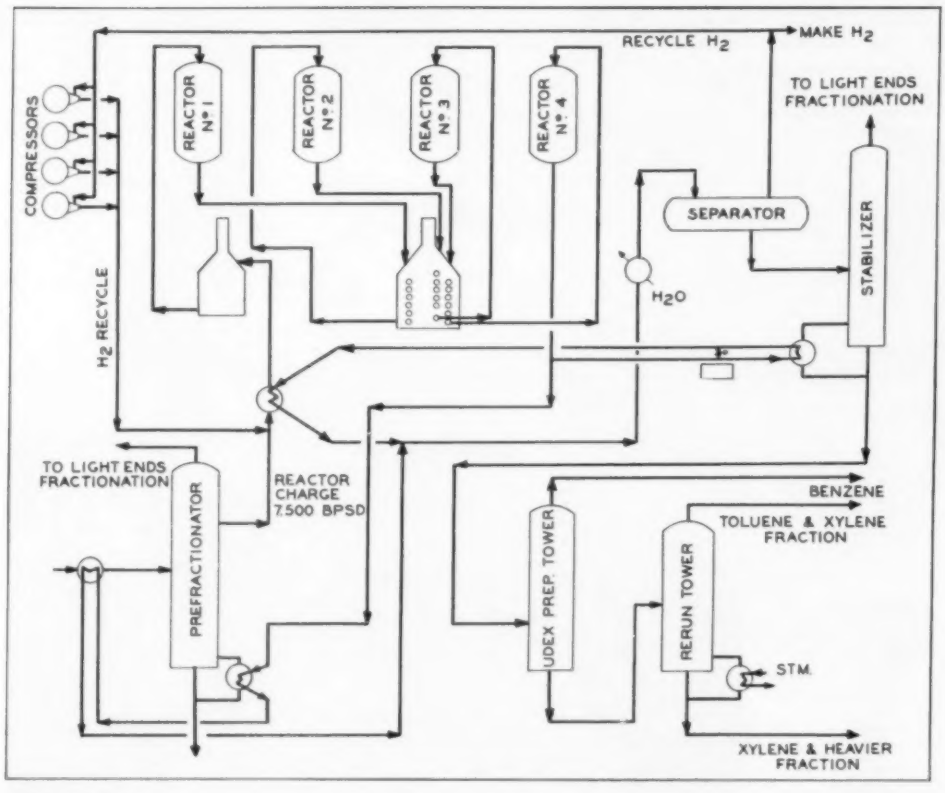
A third heater was added to reheat the effluent from reactor No. 1 alone. This transferred some of the original load from the previous intermediate heater, thereby permitting it to furnish sufficient heat to the additional ef-

TABLE 1—TYPICAL YIELDS AFTER EXPANSION

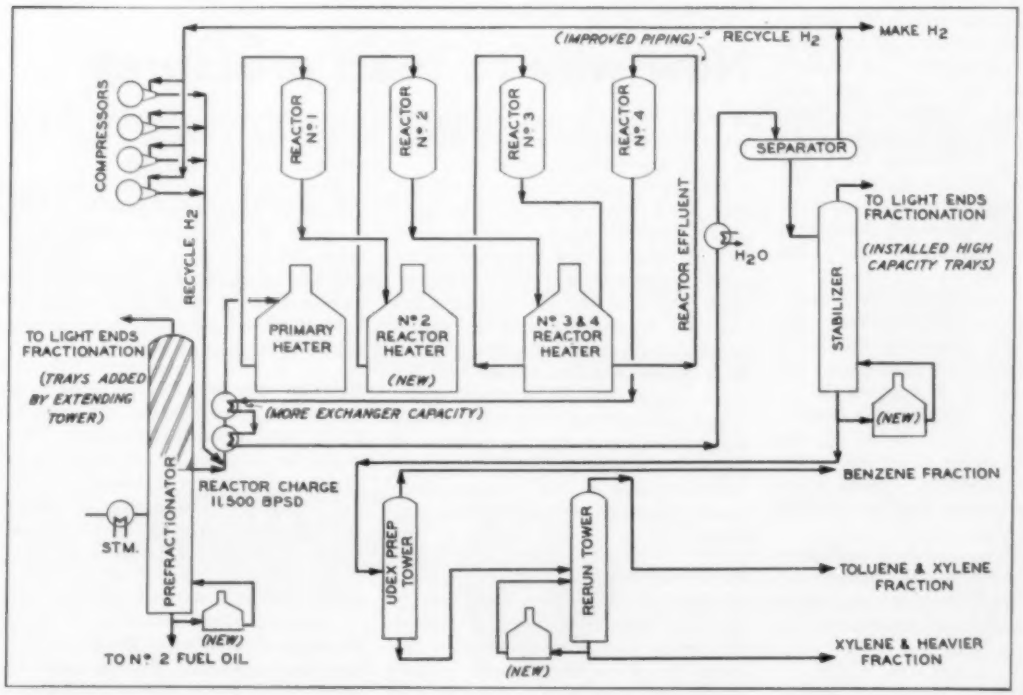
	Bbls./Day	
Charge.		
Prefactionator Charge:	13,355	100%
Yields:		
Prefract. OH gas, M.s.c.f.d.	74	
Prefract. AH, B/D	1002	7.5%
Prefract. OH, B/D	1002	7.5%
Prefract. Btms., B/D	1072	8.0%
Total B/D	13,291	99.5%
Charge:		
Reactor charge, B/D	11,217	100.0%
Liquid yields:		
Stabilizer OH, B/D	1,589	14.2%
Udex Prep. OH, B/D	2,420	21.6%
Rerun OH, B/D	4,579	40.8%
Rerun bottoms, B/D	1,945	17.3%
Total B/D	10,553	93.9%
Gas yields:		
Stabilizer OH gas, M.s.c.f.d.	607	.....
Separator gas to fuel, M.s.c.f.d.	359	.....
Separator gas to Unifiners, M.s.c.f.d.	4,170	.....

Inspections:

	Pref. Chg.	React. Chg.	Btms. Pref.	UTOH Udex Prep.	RROH Rerun	Btms. Rerun
Gravity	61.0	60.6	47.3	71.1	52.7	36.6
Flash	...	...	102	...	...	100
Ibp.	119	160	305	141	208	300
10%	172	195	320	149	216	306
50%	**244**	**241**	**347**	**158**	**233**	**319**
90%	323	301	420	183	264	348
Ep.	407	352	539	217	298	429
Sulfur	...	Nil	...	...	...	...
Color	...	...	1—	...	...	1—



BEFORE expansion of Platforming unit, this setup was used, but . . .



AFTER Platformer expansion, this setup boosted capacity by 50%

fluent leaving reactors 2 and 3 (Fig. 2). A gas-fired reboiler was installed on the stabilizer, and this eliminated the need to use a sidestream of reactor-section effluent for reboiler purposes here.

Likewise, gas-fired reboiler was installed on the prefractionator. Again, this freed the reactor-section main effluent stream from reboiler service. Hence, this full stream was available for preheating the reactor-charge stream. Additional heat exchanger capacity was added in this preheater section. The additional heat available for preheat by this arrangement is significant.

Preheat arrangements . . . Instead of preheat obtained from the reactor sidestream after it has made a pass through the stabilizer reboiler, the entire effluent stream is now used for this one preheat service. Due to the large amount of heat in the total effluent stream the primary reactor heater was large enough. Steam was used to replace the effluent previously used to preheat the prefractionator charge. One other heating change involved the addition of a gas-fired reboiler to replace the steam reboiler in the rerun tower. This was done mainly to cut down on over-all plant steam requirements.

An interesting development took place in the expansion of the prefractionator. In order to improve the separation of the streams, the tower was extended by cutting the top off, adding another trayed section and replacing the top. Additional fractionation capacity was also built into the stabilizer tower by substituting float-valve trays for bubble-cap trays.

The existing bubble-cap trays had too few caps per tray to permit the higher capacities. By retraying with float-valve trays, additional throughput at higher reflux rates has been achieved.

The high pressure drop in the system was reduced by modifying the reactor heaters, removing the back-pressure controller, eliminating reboiler and reheat exchangers in effluent system, paralleling reactor-product coolers, and increasing line sizes. Reduced pressure on the system has made it possible to operate at increased throughputs with the existing four compressors.

Other changes involved additional condensing equipment for the prefractionator, Udex prep tower, rerun tower, and additional reactor-product coolers.

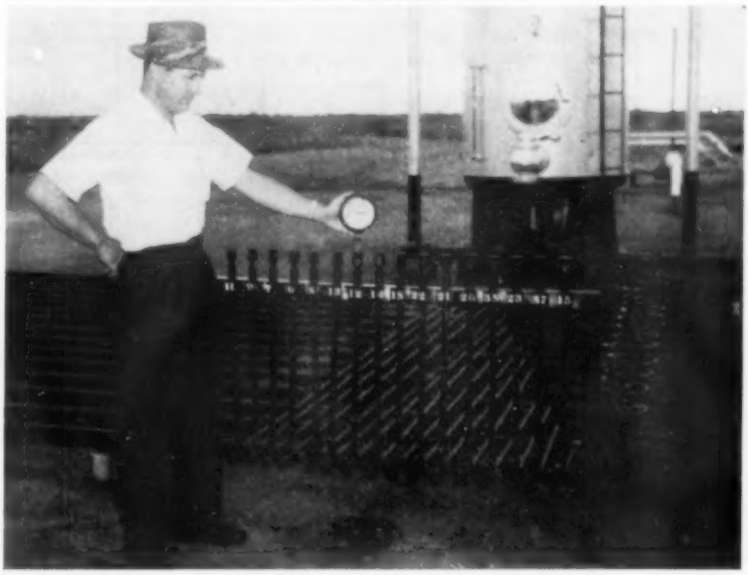
Operating data . . . Expansion has had a negligible effect on operating conditions, and the unit is functioning essentially the same as before modification. Typical yields may be seen in Table 1.

On the basis of 11,217 bbl. per day to the reactors, liquid yields are 2,420 bbl., or 21.6%, as the benzene fraction overhead from the Udex preparation tower; 4,579 bbl., or 40.8%, as the toluene and xylene fraction overhead from the rerun tower; 1,945 bbl., or 17.3%, as the xylene and heavier stream from the rerun bottoms; and 1,589 bbl., or 14.2% as stabilizer overhead charge to the light ends fractionation unit.

As a result of this expansion, not only has the throughput been increased more than 50%, but the unit is easier to start up and operate.

Acknowledgments

Cooperation of the management of Eastern States Petroleum & Chemical Corp. is gratefully acknowledged as is the assistance of Bruno Castiglioni, process design engineer, and William Heck, process control engineer.



Portable gage provides

New way to read pressures

MANY West Texas operators are using a new system to take pressure in their central tank batteries.

Key to the new system is use of a gage valve into which a master gage can be stabbed quickly and without loss of fluid. Using this gage valve, many pressures can be taken in a short time with a single gage. And, since only one master gage is used, there's no need to buy a separate gage for each pressure point. Moreover, the master gage can be regularly maintained and calibrated for a fraction of the cost of maintaining a number of gages that stay in the field. Each gage valve replaces a needle valve which would otherwise be necessary to purchase.

On 16-well manifold . . . The attached photograph shows an installation of the gage-valve system on a Phillips Petroleum Co. Embar lease in the Andector Ellenburger field. These gage valves have been grouped to take the pressures from the flowlines of 16 wells. With this arrangement, the lease pumper can take the pressure in each of the 16 lines in as little as 4 minutes with a single gage.

The flowlines are tapped immediately upstream of the battery manifold in which the production chokes have been installed. As a result, the gage will read either shut-in wellhead pressure or flowing wellhead pressure according to whether the valve in the manifold is open or closed.

Fraction of a turn . . . To adapt it to use with the gage valve, the gage is fitted with a small connector. This connector is designed to engage and disengage quickly with the gage valve. To engage, the connector is simply stabbed into the gage valve and rotated a fraction of one revolution. This makes a seal around the connector so that no well fluid is lost.

The mechanical action of the connector as it turns opens the gate valve, and line pressure is thrown onto the gage. When the gage is rotated slightly and withdrawn, the valve closes automatically, with no leakage.

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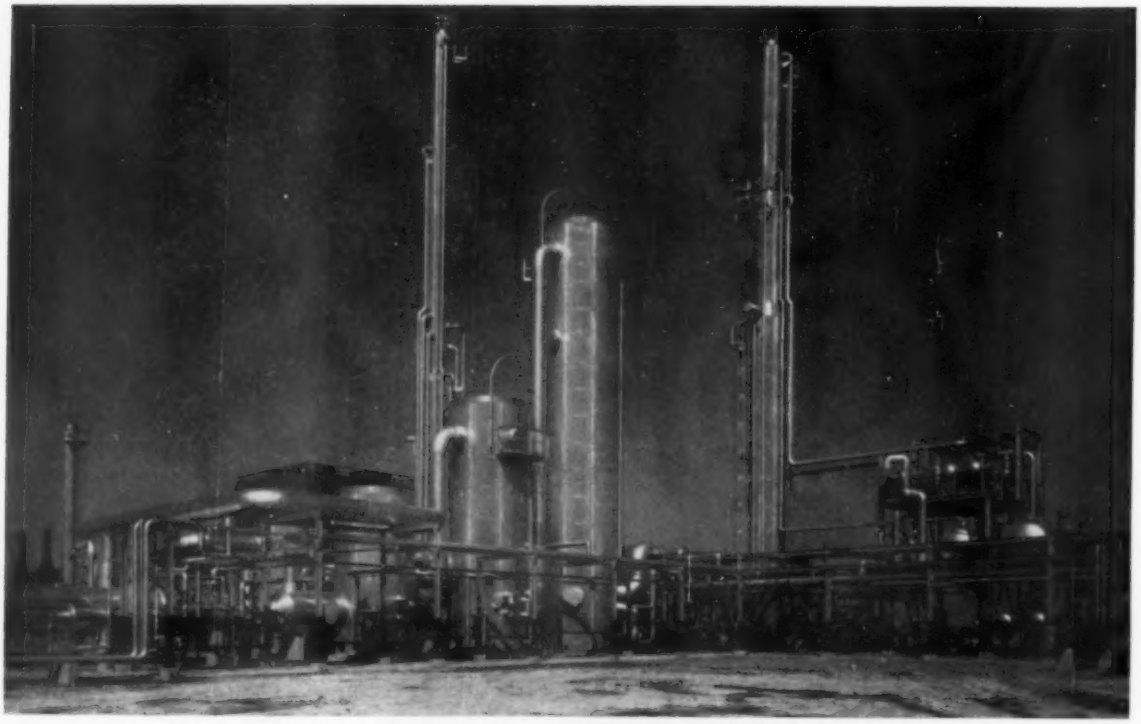


NEW PLANT at Eunice, La., built for extraction of liquids from pipeline gas, is laid out for systematic future expansion.

5,000 bbl. liquids daily from 300 M.M.c.f. of pipeline gas

. . . that's the design basis for the new $6,000,000 Eunice extraction plant

BY LARRY RESEN
District Editor

THE LOW concentration of liquids in the gas which has an average 0.67 gal. per 1 M.c.f. requires low-temperature processing at minus 40° F. This low temperature, in turn, requires that special pains be taken to dehydrate the gas before refrigeration. These aspects contributed to the building of a plant with interesting design features.

The Eunice plant is operated by Runnels Gas Products Corp., one of the joint owners and wholly owned subsidiary of Union Oil & Gas Corp. of Louisiana. The other owner is Texas Gas Exploration Corp., a subsidiary of Texas Gas Transmission Corp.

The plant is located adjacent to Texas Gas' main line in Acadia Parish, about 6 miles west of Eunice, La. Fluor Corp., Ltd., designed and built the facilities.

In the process, the plant extracts 95% of the propane, 99% of the butanes, and essentially all of the natural gasoline contained in the gas. Production each day on the basis of designed throughput amounts to 2,450 bbl. of propane; 650 bbl. of isobutane; 550 bbl. of normal butane; and 1,350 bbl. of natural gasoline. Under actual operating conditions the plant has processed as much as 355 M.M.c.f.d. of gas.

Composition of the inlet gas is as follows:

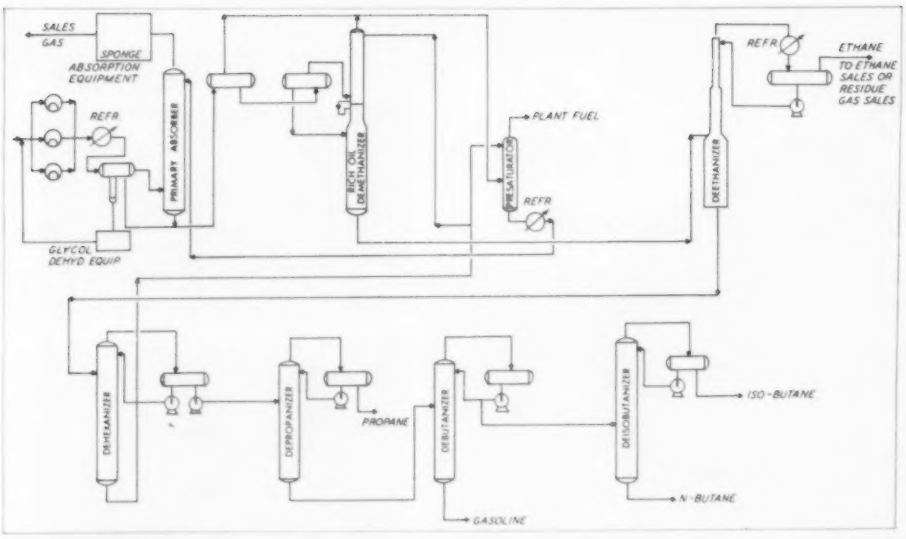
	Mole %
Nitrogen	0.22
Carbon dioxide	0.48
Methane	93.00
Ethane	4.08
Propane	1.28
Isobutane	0.28
n-Butane	0.30
Isopentane	0.07
n-Pentane	0.09
Hexane	0.11
Heptane	0.09
	100.00

Composition of the residue gas, with ethane produced as a separate product, will be as follows:

	Mole %
Nitrogen	0.23
Carbon dioxide	0.46
Methane	96.53
Ethane	2.77
Propane	0.01
	100.00

Under initial operating conditions, however, the ethane is returned to the residue-sales-gas stream, amounting to about 5 M.M.c.f. out of a combined residue-gas stream of 295½ M.M.c.f., hence its per cent of the composition would be increased accordingly. The residue-gas figures are design calculations based on an input of 306.7 M.M.c.f. of gas, of which 4.4 M.M.c.f. are required for plant fuel.

A dual absorption-oil system is employed in the plant process scheme. The primary absorption system is designed to extract liquefiable hydrocarbons from the process gas. This ab-



PROCESS FLOW PLAN provides for low-temperature processing and special dehydrating facilities, needed to prevent hydrate formation at operating temperatures.

sorber uses a narrow-boiling-range oil having a molecular weight of about 100. This lean oil is circulated at a rate of 780 g.p.m. The secondary, or sponge absorption system, is used to recover evaporated primary lean oil picked up by the stripped gas in the primary absorber. The sponge absorber uses a heavier oil with a molecular weight of about 140.

Dehydration . . . The extremely low temperatures involved in the process require that the inlet gas, although already meeting pipeline moisture specifications, needs additional dehydration to prevent hydrate formation in the various chillers and exchangers. A glycol-injection system is used to accomplish this. However, instead of a tower in which glycol-gas contact is made, the glycol is sprayed directly into the gas stream. Pumps force the glycol through spray nozzles located at the inlet of gas exchangers and chillers so that adequate contact is made. The glycol is separated from the gas stream after chilling, and sent to a regeneration unit where the liquid glycol itself is then dehydrated and recirculated. The use of glycol at this low temperature is a Fluor Corp. development.

The inlet gas is cooled to −40° F. by passing through inlet gas to residue gas exchangers, inlet gas-presaturator residue-gas exchangers, inlet gas-ethane product exchangers, and finally through the propane refrigerant chillers. After this stream passes through the glycol separators, it is charged to the primary absorber where it is contacted by the 100-mol. wt. lean-oil stream. The stripped gas is taken overhead and charged to the sponge oil absorber. Here it is contacted by the heavier weight sponge oil which is cooled to −45° F. Any lean oil picked up by the residue gas is recovered by the sponge oil and the sales gas passes through a residue gas scrubber and then through heat exchange equipment back into the transmission line. Separate equipment is used to recover lean oil picked up by the sponge oil and this includes flash tanks and a sponge oil still. The lean oil is returned to the lean oil system and sponge oil recirculated in its system.

The low-molecular-weight absorption oil in the main absorber is a heavy cut of natural gasoline removed from the bottom of the dehexanizer. This leaves a natural-gasoline product having a low end point with an exceptionally high octane rating. The research octane number of this product is 79-80 clear and 94-95 with 3 cc. of tetraethyl lead.

Rich oil from the primary absorber includes a small amount of methane, ethane, practically all of the propane and heavier hydrocarbons. This stream is charged to the demethanizer. This vessel is divided into two sections. The top section acts as a small reabsorber through which lean oil is circulated to recover ethane, propane, and heavier components carried up by the methane gas which is stripped out of the liquid in the bottom section of the demethanizer.

The rich oil, stripped of the ethane, flows from the bottom of the demethanizer where ethane is removed overhead as a gas. The rich oil, stripped of ethane, next flows to the dehexanizer where raw gasoline product containing propane and heavier material is separated overhead from the lean oil.

Presaturator . . . Lean oil from the bottom of the dehexanizer tower is then pumped over the presaturator column. The purpose of this tower is to presaturate the lean oil with methane from the demethanizer and fat-oil flash tanks before it returns to the primary absorber. Gas from the top of the demethanizer flows upward through the presaturator coming in contact with the lean oil. By presaturating the lean oil in this manner, recycle-gas compression horsepower is reduced and this also makes it possible to operate the primary absorber without the use of an oil interchiller. A portion of the gas from the presaturator is used for fuel and the remainder recompressed and injected into the residue gas line.

Raw liquid product from the dehexanizer is pumped to the fractionation section of the plant, consisting of a depropanizer, debutanizer, and deisobutanizer. The four liquid products recovered are stored in facilities capable of providing approximately 5 days' storage for each product. There are seven propane tanks, each with a capacity of 1,600 bbl., three isobutane tanks with 1,400-bbl. capacity each, three normal butane tanks with 1,500-bbl. capacity each, and three gasoline tanks with 1,800-bbl. capacity each.

Layout of the plant includes provisions for expansion of existing facilities to handle any increased throughput in the future. Likewise, provision has been made to permit increased fractionation should it be desirable to produce isopentane at some future date.

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The
REFINER'S NOTEBOOK

Mass spectrometers can speed continuous analysis in plant streams

MASS SPECTROMETERS are used in continuous analysis of plant streams at the Esso Laboratories pilot plant at Baton Rouge, La.

Esso researchers say that continuous analysis of product streams by the mass spectrometer in connection with other continuous analyzers and data-reduction systems, has proved of immeasurable assistance in obtaining continuous, almost instantaneous analytical data.

Preliminary material-balance calculations are obtained from the gas and liquid gravitometers, gas-flow meters, and volume measurements of liquid product. These data are supplemented in the final material-balance calculations by hydrocarbon-gas analyses from a process-monitor mass spectrometer.

The two gas streams (recycle and stabilizer overhead) are alternately and automatically admitted to the mass spectrometer every 15 minutes. Data for calculating the complete analysis of either 12-component stream are thus available every 30 minutes. A given period (8 to 12 hours) is usually selected for material-balance workup, appropriate spectra are selected for workup, and an average or composite analysis of both gas streams is made for that period. An electronic computer is used to solve analytical equations to give percentage composition.

AN ANALYTICAL mass spectrometer in the research laboratories of Union Oil Co., Brea, Calif. Two cabinets holding the inlet system are in center, the magnet assembly in the corner, and recording panel at far right. The upper left corner of the panel assembly holds the recording oscillograph.

Speed, Sensitivity, Range

The mass spectrometer has speed, high sensitivity, and wide range. In addition it can also analyze compounds which are not susceptible to analysis by other methods. For example, in hydrocarbon-mixture analysis, one is often confronted with two or more molecules whose molecular weights and empirical chemical formulas are identical and whose boiling points nearly coincide. These molecules differ only in the way the components of the molecules are put together. But they may behave very differently in a chemical process. The mass spectrometer reveals the composition.

In a mass spectrometer, a complex molecule gives rise to ions of many masses because the ionizing energy is always high enough not only to ionize the molecule, but to fragment it. The group of fragments arising from a given molecule (which is called the "pattern") is characteristic not only of the molecular weight, but the structure of the molecule.

In normal butane, for example, the 43 peak (the parent minus a methyl group) is more abundant than the 58 peak (parent peak). In isobutane, this tendency is exaggerated so that the 43/58 ratios are different in the two molecules. Thus by measuring these two peaks, a mass spectrometer in a few minutes can make a clean split between these two isomers.

Personnel Requirements

Routine operation of any Consolidated analytical-type mass spectrometer normally consists of (a) scanning the spectra of unknown samples, (b) daily calibration checks, (c) instrument inspection and routine maintenance.

The staff necessary for operation and computation depends upon the type of samples analyzed and the amount of detail desired. One person per shift is usually adequate to handle all instrument operations, including calibration runs and routine preventive maintenance. It is generally possible to scan the spectrum of 20 to 40 light samples or 15 to 20 heavy samples in an 8-hour shift.

The photographic paper records are normally developed by the instrument operator. Because the scanning of spectra is automatic and does not require attention, the operator can also perform other duties during scanning.

The picking of data from the records and the computation of results is normally carried on separately unless the schedule is light enough to permit the instrument operator to do it.

A scientific or engineering background is recommended only for the supervisor. All other phases of operation and computing are sufficiently routine that laboratory technicians of average capabilities can handle them adequately.

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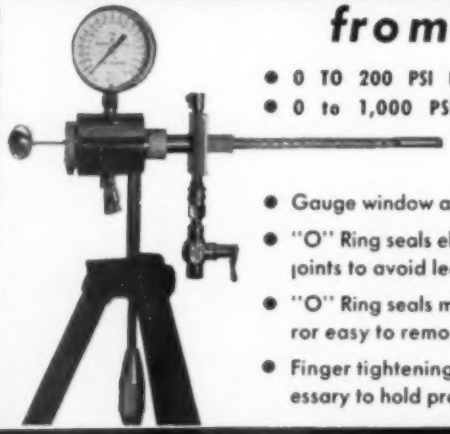

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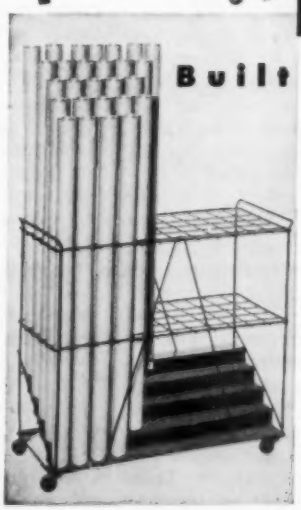

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BY W. L. NELSON
Technical Editor and
Petroleum Consultant

Cost of refinery power (corrected)

(Please substitute this page for the No. 22 Process Costimating of August 11, 1958, which unfortunately had an error in the scales of Fig. 1 and showed too high cooling requirements.)

THE CHART shows hourly and daily fuel costs of various power drives in terms of unit prices that can easily be converted by ratio to actual power costs. Thus if the cost of electricity is 8.5 mills rather than 1 cent, the power cost will be only 85% of that shown. In the case of steam for power turbines, a price of 30 cents per 1,000 lb. had to be used to keep the lines from overlapping one another. Water rates for the turbines are indicated by large solid points on the curves.

The cost of labor, maintenance, and investment is not included because such items are included as part of the over-all operating costs of units or plants. Lubricating-oil consumption ranges from 0.01 gal. per 100 hp.-hour (steam engines) to 0.08 gal. for diesel and slow-speed gasoline engines. Maintenance costs for large gas engines usually range from 50 cents to $1.00 per year per horsepower-hour.

Modern equipment operating at design load conditions will operate at slightly lower fuel costs than shown here whereas older equipment operating at makeshift conditions will cost more than shown.

The cooling required for small diesel engines and small high-speed gas engines is about 3,000 B.t.u. per brake horsepower—and old horizontal gas engines may require 3,900 B.t.u. Supercharged and large modern engines require less cooling (1,500-2,200 B.t.u.).

Large gas turbines can be used but only if the waste heat is utilized by waste-heat boilers, or for driers or air heaters, because the thermal efficiency is under 27% whereas modern supercharged gas engines have efficiencies of about 40%.

The power actually delivered to liquids, gases, etc., is lower than the driver or brake horsepower by the mechanical inefficiency of the compressors, pumps, etc. Efficiencies were discussed in Process Costimating No. 23 (Aug. 18, 1958). Process Costimating No. 21 (July 28) discussed the steam required by reciprocating steam pumps.

The fuel cost for larger equipment can be approximated by multiplying the costs for the 100-1,000-hp. range by 10—or for electric motors, using the dashed line and multiplying by 100.

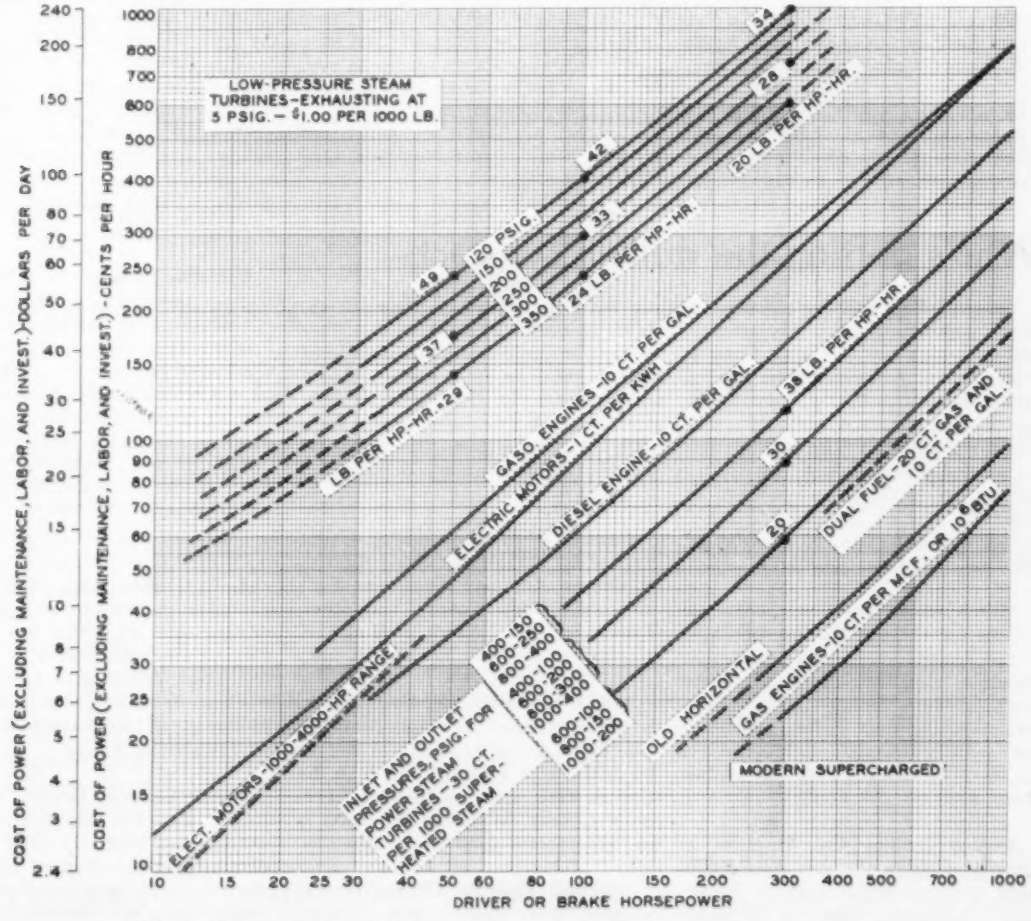

FIG. 1—Approximate cost (fuel) of brake horsepower from various prime movers.

▶▶▶ Among the Drilling Contractors

Drilling picks up for Arizona contractors with 12 rigs active

MORE THAN 12 rotary rigs now are busy in new exploratory drilling in Arizona. This is the greatest number reported active at any time in the state's history.

Particularly significant is the fact that exploration is stepping out the Four Corners area in the northeastern corner to other sections of the state. This includes two wildcats in Cochise County, in the southeastern corner of the state; one in Mohave County, in the northwestern section; and two in Yuma County, in the southwestern corner. The remainder is in Apache and Navajo counties, in the northeastern part of the state.

Most of the drilling is by contractors. Among contractors now busy are B. Hiends, Abilene, Tex.; C. W. Riley, Aztec, N. M.; Rutledge Drilling Co., Santa Fe., N. M.; Carroway Drilling Co., and Stroud-Aldridge Drilling Co., both of Odessa, Tex.; Crowe Drilling Co., from Oklahoma; J. B. Nelson Gravel Packing & Drilling Co.; and John R. Niblett.

In addition, Superior Oil Co. has a company rig working in the Bita Creek area, in Apache County. Gila Valley Drilling Co. is drilling for its own account in Yuma County, and Besoil Co. is using its own rig in the Holbrook area of Navajo County.

Rutledge is drilling for Humble Oil & Refining Co. in the East Boundary Butte area, in northeastern Apache County, near the Utah line. It is a 6,600-ft. drilling. C. W. Riley's two rigs in the state are working for Kerr-McGee Oil Industries, Inc., one on Nine Mile anticline, and the other on Pinta dome, both in Apache County. Niblett has a rig under contract to Southwest Drilling Co. on a 4,000-ft. Devonian test in Cochise County. Carroway Drilling Co. is in the Guadalupe structure in the same county with a 5,500-ft. granite test for L. A. Thompson, Robert Manley, and Sterling Oil Co. of Oklahoma.

Stroud-Aldridge Drilling Co. is in Mohave County on contract to Toney Lyons and C. C. Harrison. Nelson is drilling for Gila Valley Drilling & Gas Co. on a shallow prospect northeast of Yuma. Nelson's rig augments one Gila is operating for its own account in the same general area. Crowe is on a 4,000-ft. granite test for Lydia Johnson Trust in the Holbrook area of Navajo County.

Who's getting the drilling contracts

Viersen & Cochran, Okmulgee, Okla., contracting firm, has taken a well-deepening job in Logan County, West Central Arkansas. It is on the Pine Ridge anticline, 2½ miles southeast of Ratcliff, and about 6 miles southwest of Parish. The well, a wildcat drilled by this firm for Carter Oil Co. in 1957, and abandoned at 7,025 ft., will be deepened to 8,500 ft. for T. H. Barton, of El Dorado, who has taken over the hole.

Milton Crow, Inc., Shreveport, is drilling for **O'Brien Drilling Co.,** also of Shreveport, at a wildcat location about ¾ mile west of North Fouke field, in Miller County, southwestern Arkansas. Contract is for a 4,500-ft. test with location at 1 Hayden, in 25-16s-27w. Location is about 5½ miles northeast of Fouke.

Burdett Drilling Co., Houston, is keeping a rig in the new East Basile field, southwestern Evangeline Parish, South Louisiana, where it is under contract to Sun Oil Co. It now is starting on its third well, 2 Haas-Hirsch, 3,600 ft. northeast of Sun's discovery well, drilled by Burdett, and completed last August. The latter well is oil productive from pay at 7,988-96 ft. Burdett's second well, now being completed, opens a new gas-condensate pay. Its latest operation is scheduled to go to 8,700 ft.

Casner & Benz, Oildale, Calif., have a rig working for Getty Oil Co. in Belgian Anticline field, near Taft, in western Kern County, California. Present job is a 7,500-ft. well at 33X Siegfus, in 26-30-21, in the R-K area

Will I. Lewis Drilling Co., Denver, is under contract to Continental Oil Co. for a 9,000-ft. Morrison test to be drilled at a wildcat location in the Crooks Gap area, southeastern Fremont County, Wyoming. Location is on government land in 21-28n-92w.

Maxwell Herring Drilling Corp., Kilgore, Tex., has a new contract operation under way in Christmas Day field, 2½ miles northeast of Talco, in Titus County, northeastern Texas. It is a 6,800-ft. Paluxy well for John Stephens and R. L. Peveto on their Lewis lease in the M. V. Delgado Survey.

Baker-Taylor Drilling Co., Amarillo, Tex., is the contractor on a 9,750-ft. wildcat Petroleum Exploration, Inc., also of Amarillo, is putting down 16 miles south of Perryton, in South-Central Ochiltree County, Texas Panhandle. Location, at 1-95 McLain, is 1¼ miles south of Petroleum Exploration's recently completed Morrow discovery well.

Hayden Farmer Drilling Co., Olney, Tex., has a new contract operation in southeastern Anderson County, near the Houston county line, in East Texas. It is a 5,600-ft. Woodbine test for W. C. Perryman and George J. Greer, of Athens, Tex. Location, at 1 Pope et al., in the Washington Lewis Survey, is about 10 miles southeast of Slocum.

Wagner & Wynant Drilling Co., Amarillo, Tex., is drilling on a new contract job in Bent County, southeastern Colorado. It is a 5,000-ft. Mississippian test for D. D. Harrington. Location, at 1-A Wilson, in 2-21s-48s, is a mile south of gas production. It is in the northeastern corner of the county about 12 miles northwest of Lamar and 15 miles south of Eads.

Coulston Drilling Co., Tyler, Tex., is on a new wildcat operation south of Stamps, in Lafayette County, southwestern Arkansas. Drilling is for Coulston's own account with location on a Carter Oil Co. farmout. Location (1 Cornelius Estate, in 32-16s-23w) is 3½ miles northwest of recently opened Northeast McKamie field. It is a Smackover test with depth objective of 8,600 ft.

J. C. Trahan, Inc., New Orleans, has taken on a South Louisiana deep-drilling job for **Shoreline Drilling Co.,** of Shreveport. It is a 14,000-ft. test at 1 Continental Land & Fur Co. in 44-17s-15e, about 1½ miles southwest of production at Gibson, in Terrebonne Parish.

Buster Gardner Drilling Co., New Iberia, La., has the contract on a wildcat test Riverside Oil Co. is undertaking in the Gulf of Mexico off the tip of Plaquemines Parish, Louisiana. It is a 10,300-ft. test with location in Block 14, South Pass area.

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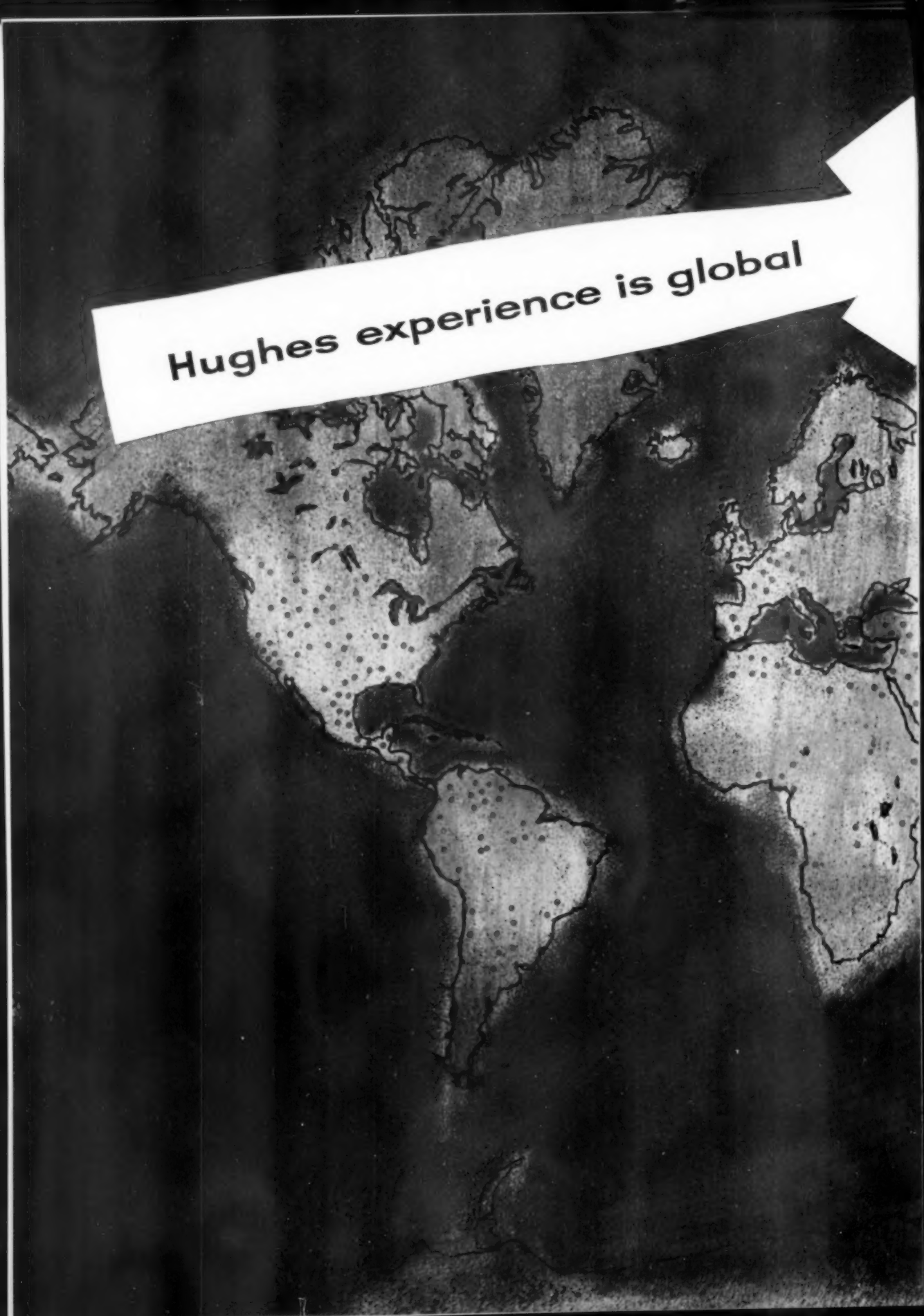
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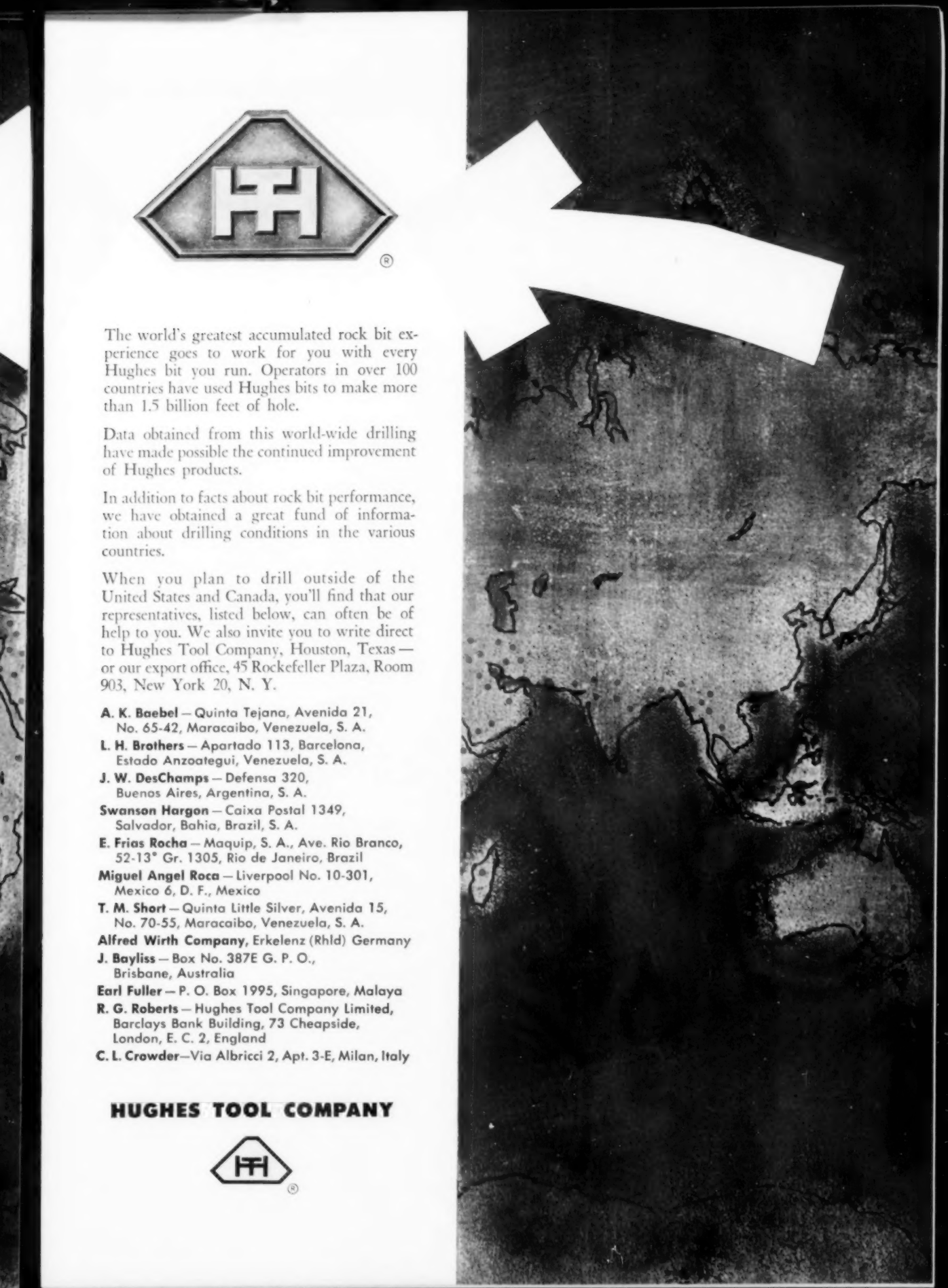

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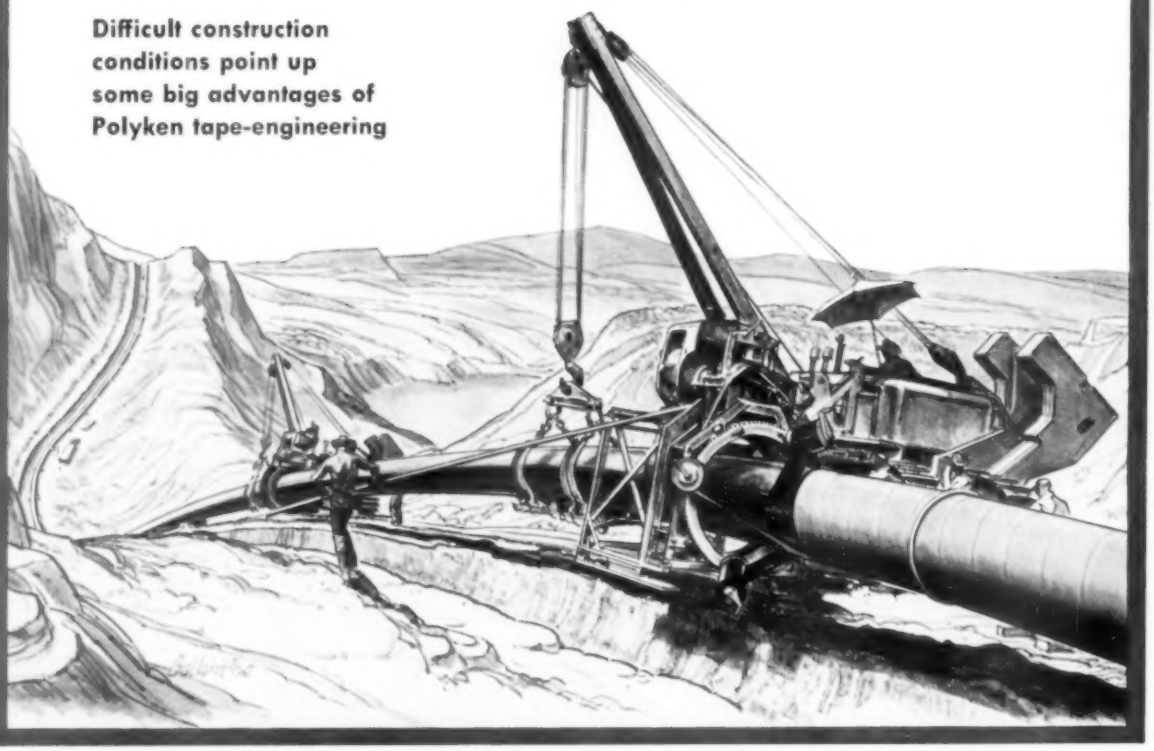

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Uprate flanges with an O-ring seal

Advantages of using an O-ring seal with a flat-face flange for the ASA 300 welding-neck series up to the 24-in. size are pointed out in this report. It is often possible to uprate ASA 300 flanges to a higher pressure rating for this service than indicated in ASA standard.

BY J. W. SQUIRE
Research and Development Engineer
Service Pipe Line Co.

FLANGE DESIGN has a history going back some 135 years. It has developed gradually, with much technical work by many competent engineers and mathematicians contributing to the standardization of sizes, types, and stress levels for the designs we now have. ASA B16.5 now has seven pressure-rating classes varying from 150 lb. to 2,500 lb., ranging in size from ½ in. to 24 in. with several different facings and four basic types.[1]

In the order of the best-balanced design these types are: (1) "welding neck" or "high hub," (2) "slip-on," (3) lapped, and (4) screwed.

As a crude-oil pipeliner (and not a flange designer), my remarks will be confined to the welding-neck flange for crude and products lines at 100° F. and the possibilities of using an O-ring as gasket material.

Previous tests . . . In 1953, Service Pipe Line Co. made a series of preliminary stress calculations and tests[2] on 4 and 12-in. flanges. They compared generally the effects of using a raised-face flange and a fiber or spiral-wound metal-asbestos gasket with either a raised-face or a flat-face flange grooved for an O-ring.

We concluded from these tests that ASA 300 flanges, welding-neck flat-faced, O-ring seal, in sizes up to 12-in. may be safely used for 1,440-psi. working pressure in crude and product service. In these smaller sizes, it is a simple matter to achieve an ASA 600 rating for an ASA 300 flange at 100° F. or lower. The flanges are not stressed above the 17,500 psi. allowed in the ASME Boiler and Pressure Vessel Code.

From a paper presented at ASME petroleum mechanical engineering conference, Denver, Sept. 21-24, 1958.

Flange Design

The ASME Boiler Code method of flange design is based on a study by Waters, et al., in 1937.[3] First, moments are calculated for the external forces on the ring and hub, i.e., the bolt load, gasket reaction, pressure load on the flange face, and hydrostatic end force. Next, longitudinal, radial, and tangential stresses are determined from these moments.

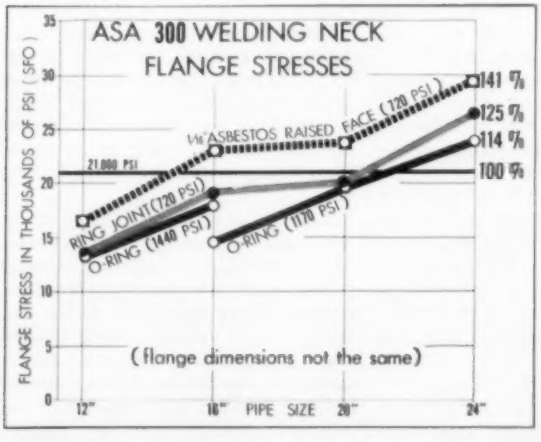
Finally, the design stress is taken as the average of the longitudinal stress and the higher of either the radial or tangential stress. This method is generally satisfactory for any case where the gasket is entirely within the bolt circle and the flange is free to rotate outside the bolt circle. It is not applicable for a full-face gasket on a flat-face flange or for an O-ring grooved flat-face.

The raised face and "O-ring-plate" stresses are based on the Boiler Code design formulas. The O-ring grooved-flange stresses are calculated in accordance with the modified Rossheim theory which has been under consideration in the ASA B16 Flange Committee for several years.

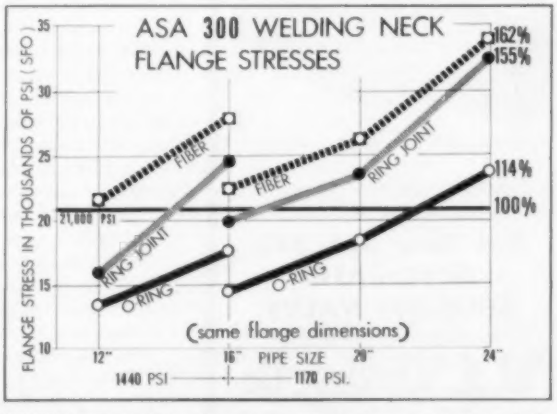
This theory takes into account the restraining moment of the flange face outside the bolt circle which serves to reduce the critical stresses in the flange.

In the normal raised-faced assembly the initial bolt load must be comparatively high to produce a seal on the gasket. When an increasing hydrostatic pressure is applied, this bolt load is first relaxed and then increased until the flange rotates sufficiently to allow leakage. As the flange rotates, excessive stresses are introduced in the adjacent pipe wall.

With an O-ring seal, using a lighter flange and, with proper design,



STRESSES of more than 40% above a secondary rating of 21,000 psi. at 720-psi. internal pressure are possible even with a standard design. Fig. 1.



VALUES calculated using same dimensions and pipe thicknesses as in Fig. 1, with different gaskets. Fig. 2.

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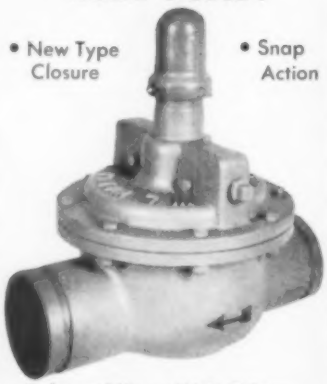

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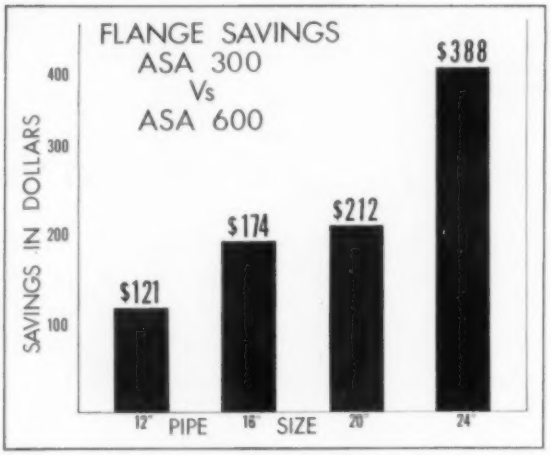

SAVINGS for pair of flanges when ASA 300 flanges are used instead of ASA 600. Fig. 3.

stresses which are more compatible with those in the piping system can be achieved. A conservative approach from the stress standpoint can still be maintained.

Fig. 1 shows that even with a standard design, accepted by ASA B16.5, it is entirely possible to achieve stresses of more than 40% above a secondary rating of 21,000 psi. at 720-psi. internal pressure. The two top lines were taken from data published by one of the manufacturers in 1953.[4]

The lower broken lines are calculated values on a flat-face flange with an O-ring groove and show the effect of uprating this flange to the internal pressures shown. While this is not a direct comparison, since different dimensions were used, it illustrates the possibilities of using an O-ring. The 21,000-psi. flange-stress rating was indirectly sanctioned by the ASA B16 Flange Committee, but not codified.

Fig. 2 shows a more direct comparison. Values were calculated using the same dimensions and pipe thicknesses with different gaskets. At 1,170 psi. the stress in a raised-face 24-in. ASA 300 with a fiber gasket is more than 40% greater than stress for a flange with a flat face and O-ring groove. In effect, this allows uprating the flange about 60% (from 720 to 1,170 psi.) for a 24-in. size and 100% (from 720 to 1,440 psi.) in the smaller sizes shown. The pipe wall thicknesses used are commensurate with commonly used station ratings for API 5L Grade B or API 5LX42 pipe. The critical hub length (h) is conservatively taken as ¾ in. back from the pipe end of the flange.

Both O-ring systems reduce the stresses in the flange when direct comparisons are made and there is little difference in these stresses with either O-ring system. This is due primarily to the reduced hydrostatic end force from having the seal closer to the fluid than in the standard gasketed flanges.

Bolt Stresses

Neither of the O-ring systems requires an initial bolt stress in excess of 6,000 psi. The other systems assume an initial bolt stress of 20,000 psi. In the groove system, however, we have assumed that this initial 6,000-psi. stress is added to the operating bolt stress.

In the plate system we have not made this assumption because the flange is free to rotate. This makes the bolt stress higher for the O-ring groove but still less than that for the standard gasket systems under the same operating conditions. In neither O-ring case are they excessive.

Practical Considerations

The pipeliner is concerned with several aspects other than the stress level.

First, what happens to O-ring flanges in case of fire? In a flange with an O-ring seal the seal is closer to the flowing fluid. This seal will be subjected to less heat from external sources than the seal on a raised face. Fires are fed only when leakage occurs.

Leakage occurs only when there is relaxation of the bolts or distortion of the fitting. In addition, O-rings should cause no more concern from this standpoint than those in the gate valves, check valves, pumps, scraper-trap closures, etc., which are now installed in the modern pump station.

Second, how about vibration or mechanical misalignment or thermal stresses? Vibration, mechanical, or thermal stresses are probably less seri-

ous in lighter-weight flanges with O-rings than the heavier standard flanges that transmit these stresses more severely to the lighter-weight piping system.

Third, how about ease of replacement? With the ring-plate system some experiments will be necessary to arrive at a satisfactory means of replacement in close locations. This shouldn't be any more difficult than replacing a flat gasket and definitely will be easier than replacing a ring joint.

Fourth, how about sand or other foreign material affecting the tightness of the seal? Since the sealing part of the O-ring is against its outer edge, we see no problem while it is in service. For replacement, a groove in the flange might be a little more difficult to clean than a raised face. A plate system would not.

Fifth, how about solubility of the O-ring in the product used? Satisfactory materials are available which will avoid solubility in the liquids handled and aging of the ring.

Sixth, how about excessive bolt tightening? Excessive bolt tightening is a matter of field control. We suggest using wrenches without extension which have a limited-length handle.

Admittedly, there are some problems to solve in designing a flange properly to use an O-ring. We recognize that the machining of the flange face and the groove itself can present some problems. These can be solved only by proper design and service experience.

They do not appear to present any difficult or expensive obstacles. It is certainly not desirable to promiscuously assign higher ratings to flanges. Each case should be considered separately. The O-ring approach has merit, however, and deserves consideration for this service.

How much do we save by using this method? Fig. 3 shows typical savings for a pair of flanges if ASA 300 flanges are used instead of ASA 600 flanges. Costs shown are factory costs for a pair of flanges plus bolts.

References

1. A. R. C. Markl and H. H. George, "Fatigue Tests in Flanged Assemblies," Transactions ASME, Vol. 72, No. 1, Jan. 1950, pp. 77-87.

2. E. C. Schuster and V. L. Rupe, "Getting the Most From Your Flange Dollar While Using O-Rings," Pipe Line Industry, Oct. 1955.

3. E. O. Waters, D. B. Rossheim, D. B. Wesstrom and F. S. G. Williams, "Formulas for Stresses in Bolted Flanged Connections," ASME Transactions, Apr. 1937, pp. 161-169.

4. Piping Engineering, Part 6.02, Tube Turns, Inc., Nov. 1953.

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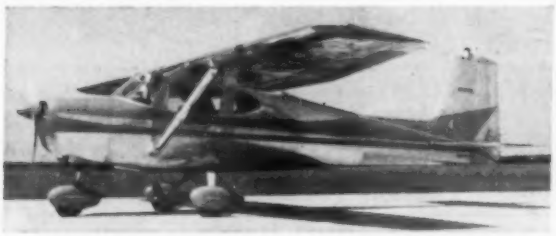
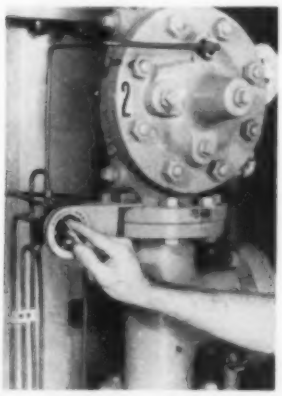


Two-place plane cruises at 121 m.p.h.

. . . and comes in three models for multiple uses. The new Cessna Model 150 is a high-wing, all-metal, single-engine airplane equipped with "Land-O-Matic" landing gear.

It's powered with a four-cylinder Continental O-200-A engine, rated at 100 hp. at 2,750 r.p.m. The plane has a maximum speed of 124 m.p.h. at sea level and a maximum recommended cruising speed of 121 m.p.h. using 70% power at 9,000 ft. Range at maximum cruise is 520 miles or 4.3 hours.

Service ceiling is 15,300 ft. Gross weight is 1,500 lb. Optional equipment includes special patroller wing with an additional fuel capacity for pipeline or other patrol duty where additional range is required. **Write or call: Cessna Aircraft Co., Wichita, Kans., for details on Model 150.**



Control actuates 36 valves

. . . from one spot, allowing complex processes to be controlled by the simple turn of a dial. The new Avsco Liqui-Dial DM control uses hydraulic pressure to actuate valves. It can be used to open or close valves in any preset sequence.

Process pressure may be used to actuate the control valves. The control is, in effect, a multiport pilot valve, manually operated by an indicator knob on the dial face. All ports are controlled by rotation of a multiport disk. This disk can be designed to give any desired combination of valve openings. Two or more valve openings can be operated from one pilot port.

Potential uses include filtering systems, water-treating plants, and other services where valves must be operated in a given sequence. **Write or call: Automatic Valve Systems Co., Inc., 1535 Monrovia Avenue, Newport Beach, Calif., for details on DM Control.**

●

Eight-inch Saran-lined pipe

. . . made to allow handling of larger volumes of corrosive liquids and gases. Nine sizes of pipe, valves, and fittings from 1 through 8 in. are now available, the maker reports.. The pipe comes with threaded ends in maximum lengths of 10 ft.

The Saran liner is a vinylidene chloride copolymer resin resistant to most inorganic chemicals and to most organic solvents and compounds. It can be used in applications operating at temperatures from below zero to 200° F.

The pipe can be easily adapted to join to other corrosion-resistant piping systems. **Write or call: Saran Lined Pipe Co., Ferndale, Mich., for details on 8-in. lined pipe.**

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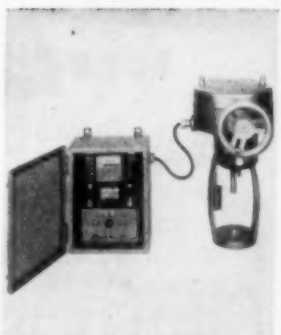

New electric valve positioner

. . . eliminates need for auxiliary hydraulic and pneumatic valve-actuating systems, the maker claims. It's designed to operate from most standard electric controllers. A 1/40-hp., two-phase, induction-type of motor drives the actuating shaft through a gear train and ball-and-screw mechanism.

Transistorized and explosionproof, the positioner can be manually operated if power fails. The braking sys-

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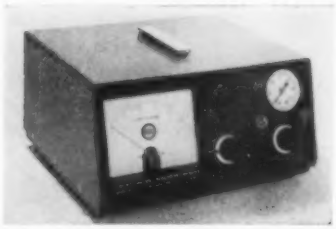
tem prevents valve oscillation and assures repeatability to within 0.25%.

Stroke is field-adjustable from ½ to 2 in.; stem speed is 0.15 in. per second, and maximum thrust is 1,000 lb. with the standard gear train. Built-in limit switches prevent valve damage. **Write or call: Norwood Controls Div., American Standard Products, Norwood, Mass., for Data Sheet B158-3.**

Moisture monitor uses increased

. . . with three new accessories now available. One accessory is a sample vaporizer. It permits measurement of any liquid with a vapor pressure between 10 and 100 psig. at ambient temperature. The vaporizer's three main components are housed in a metal case designed to attach easily to the side of the CEC Type 26-301 or 26-302 Moisture Monitor. Components comprise (1) an adjustable, electrically heated, thermostated vaporizer valve, (2) oil separator with



teflon packing to remove unvaporized liquid from sample stream, and (3) bypass system for purging the sample line.

The second is a self-contained-battery power supply. It can be attached or removed quickly, permitting the moisture monitor to be independent of external power. The third is a sample bypass to give positive indication of sample flow. **Write or call: Consolidated Electrodynamics Corp., 300 North Sierra Madre Villa, Pasadena, Calif., for details on accessories for moisture monitor.**

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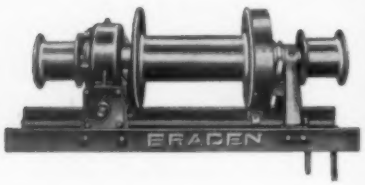

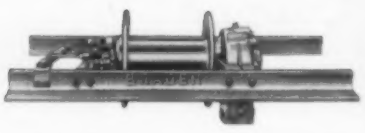

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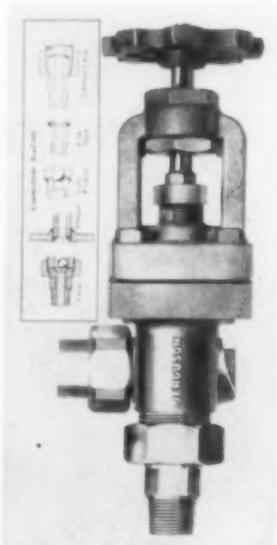

Gage valve threads stay outside

. . . of valve body so they aren't affected by the fluid handled or temperature changes. The new design of the outside-screw-and-yoke bolted-bonnet valve for use with liquid-level gages and instruments allows the valve stem to work freely and prevents seizure. The bolted bonnet uses a forged yoke which supports the stem away from the valve body and a separate, forged, gland follower which bears directly on the packing and is entirely independent of the yoke.

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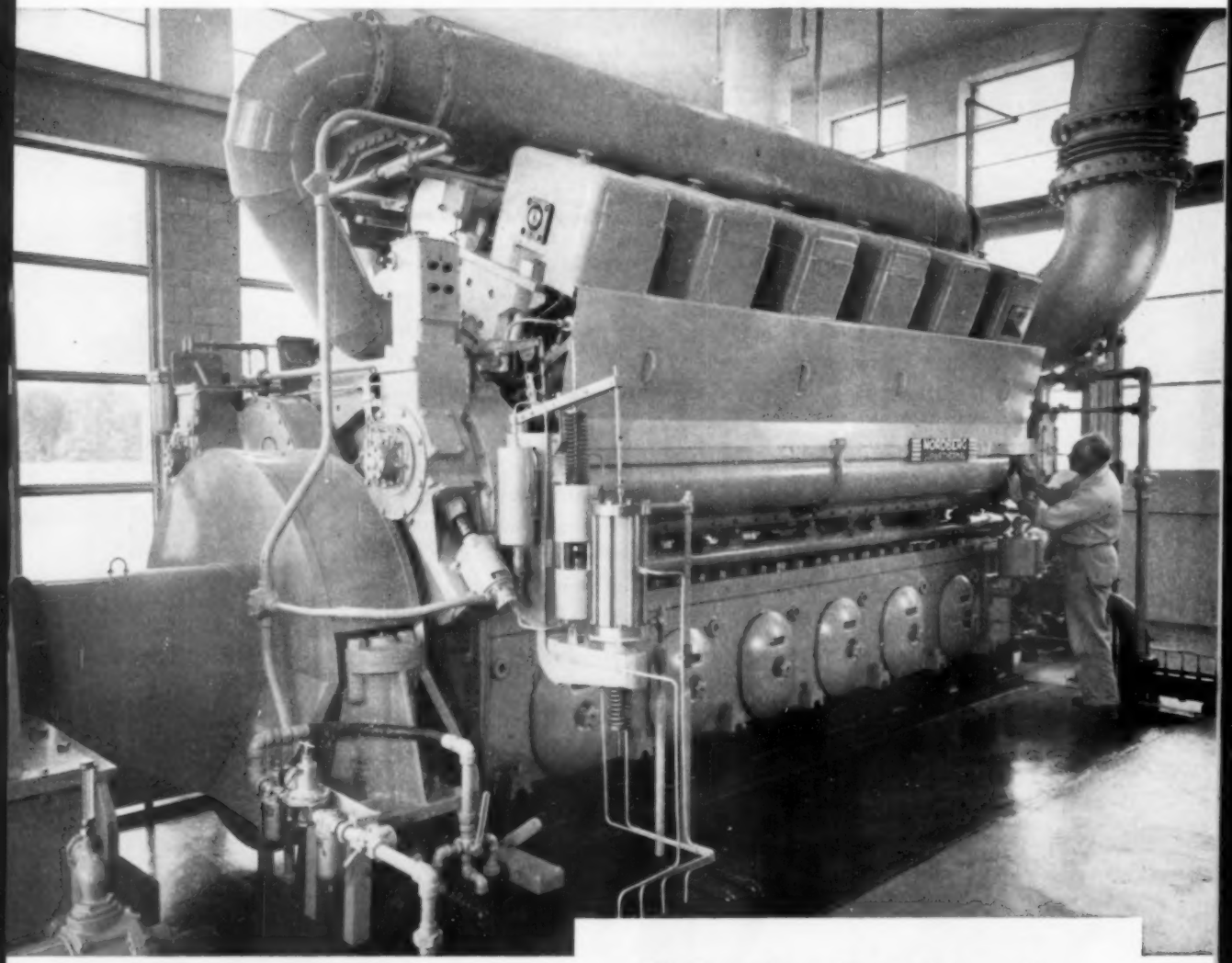

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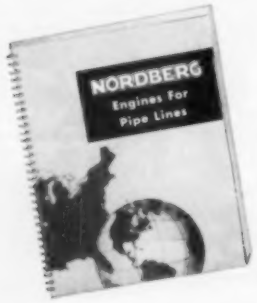

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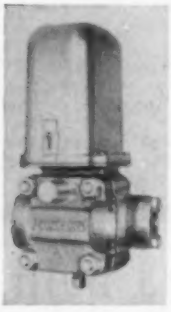

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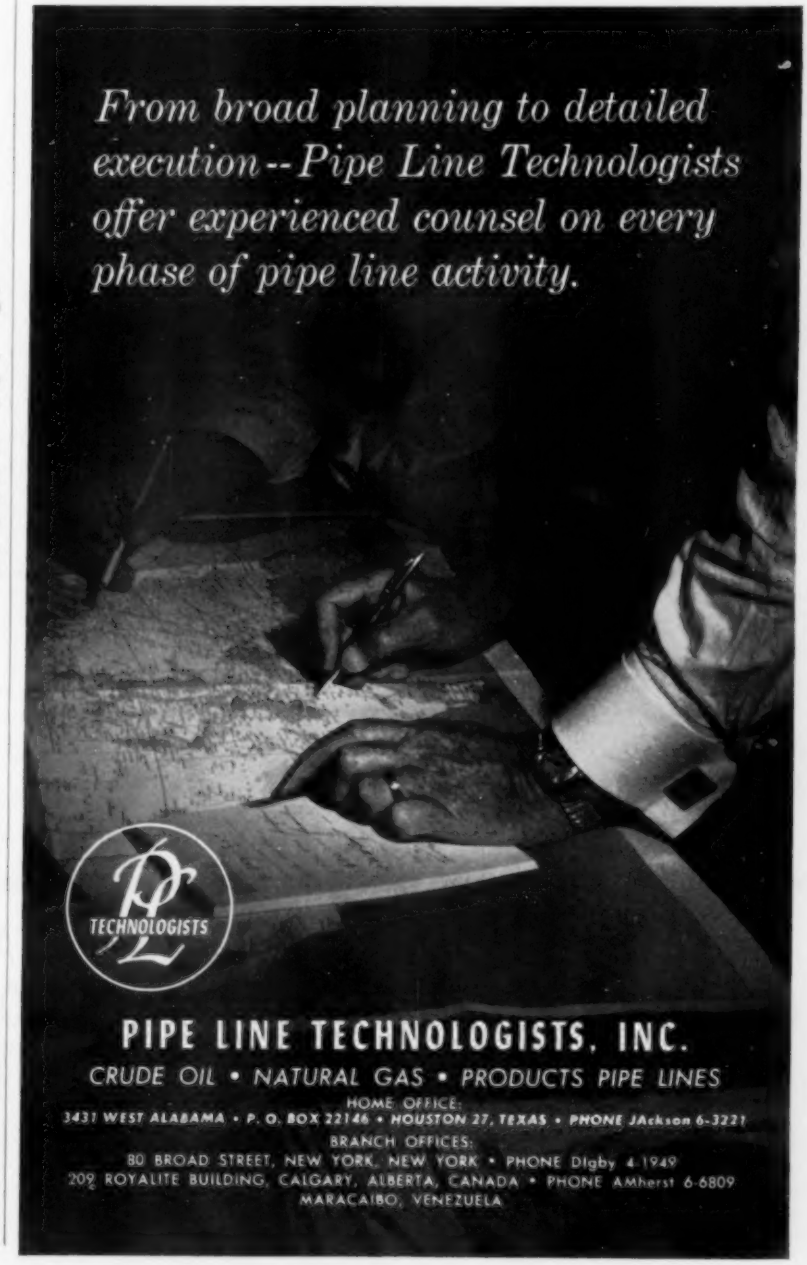
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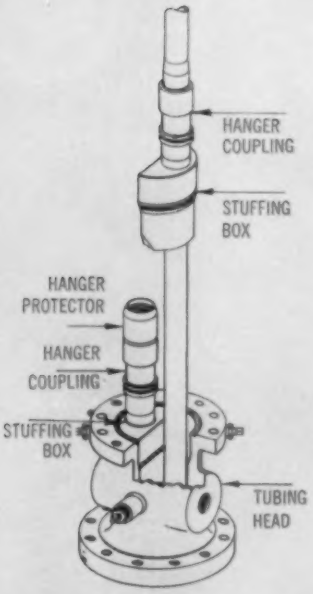
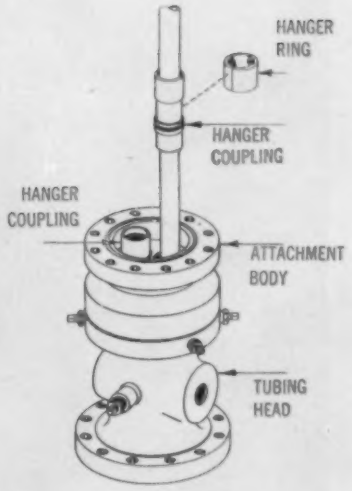
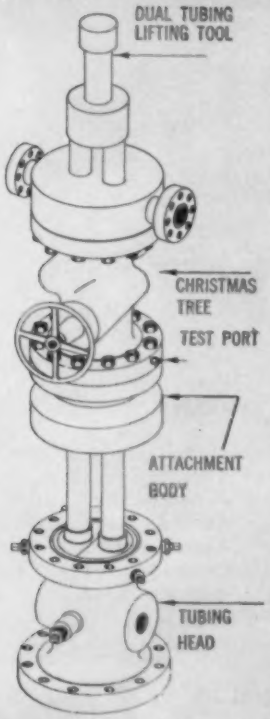


1. Stuffing boxes and tubing hangers are landed in the O-C-T Universal Tubing Head. Well is protected by Otis Back Pressure Valves. Stuffing boxes are used in place of dual hangers in the O-C-T Universal Tubing Head.



2. Hanger is lowered into the attachment and landing joint removed. Both strings are now hung.



3. After mud is circulated out of tubing and both zones are in, tubing is lowered and attachment body is flanged up and tested. If workover is necessary, well may be killed by lifting tubing and circulating mud.

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The new O-C-T U-65 Dual Tubing Hanger Assembly makes it possible to bring in or to kill both zones of a dual completion simultaneously under full pressure control and without down-hole circulating valves. The U-65 works efficiently with all types of packers, any combination of packers, and including hydraulic packers.
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Regulator materials can be carbon steel, Type 316 stainless steel, or special alloys to handle a variety of liquids. **Write or call: W. A. Kates Co., 430 Waukegan Road, Deerfield, Ill., for information on liquid-ratio regulator and blender.**

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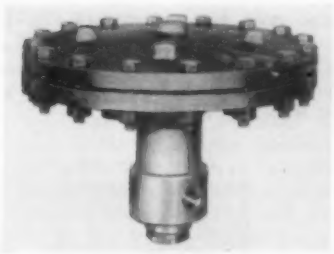


High-pressure reducing valve

. . . handles large-ratio pressure to reductions from 6,000-psi. initial pressure to outlet pressures from 100 psi. upward to within 20% of the initial pressure in one stage. The Type E, Fig. 198 valve is adapted for air and other gas or hydraulic operation.

To control reduced pressure, an air-reducing and relief valve is used to charge a diaphragm chamber. Easy adjustments can be made from remote points. Valve trim is stainless steel. Nylon seats for handling hydrogen are available. **Write or call: Atlas Valve Co., 280 South Street, Newark 5, N. J., for details on Type E pressure-reducing valve.**

•

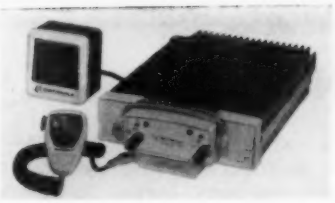
Tool-joint compound stops galling

. . . of threads and prevents thread seizure, the maker claims. It is a lead-base thread lubricant formulated especially for tool-joint threads and is strongly resistant to corrosion. **Write or call: I. H. Grancell Co., P. O. Box 4785, Florence Branch, Los Angeles 1, for details on Mr. B thread lubricant.**

Transistorized two-way mobile radio

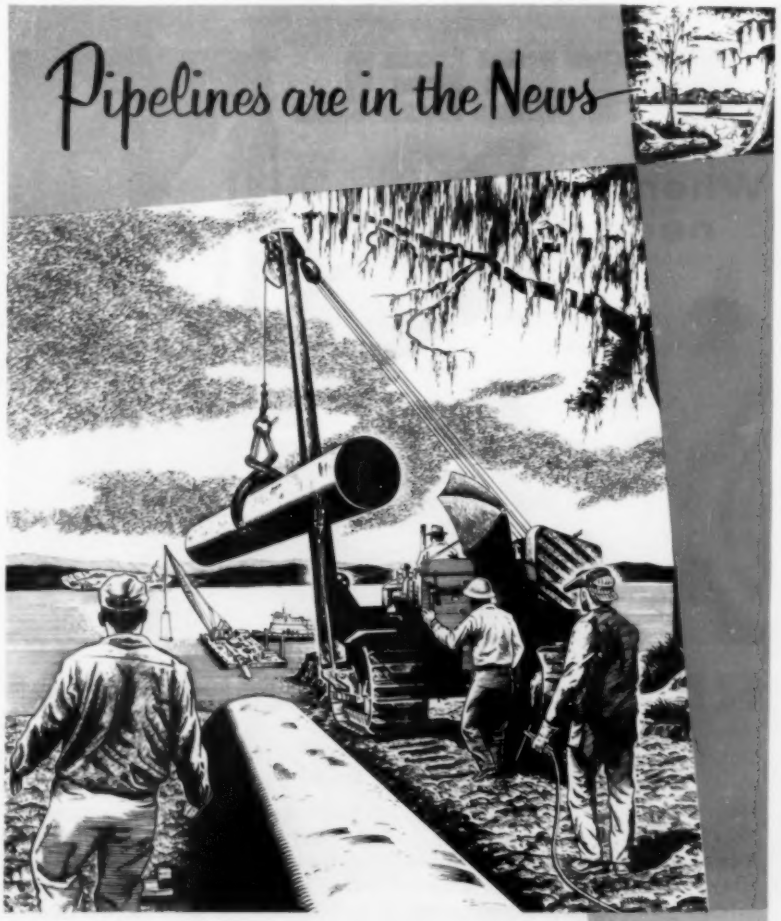
. . . is now being given operational field tests. Called the Motrac radiophone, it has a completely transistorized receiver and power supply and a partially transistorized transmitter.

More than 20 transistors are used. Printed circuitry, modules, and die-cast construction are employed. The entire unit is 3 in. high, 11 in. wide, and 17 in. long. Low power consumption is one outstanding feature cited. The complete unit draws 1.82 amp.—about one-third that of older



two-way radios while on standby, the maker says.

This feature allows radio users to leave their radio on at all times to hear messages even when the engine is turned off, with little effect on battery life. The radio will be available



SHOWCASE . . .

New Equipment

for operation in both the low (25 to 54 mc.) and the VHF (147 to 174 mc.) frequency bands. Twenty-five watts is the power output in the higher band and either 30 or 50 watts in the lower band. The receiver has an audio output of 5 watts. The radiophone mounts either in the trunk or under the dash. It is available in carrier squelch and in carrier and coded-tone squelch models. **Write or call: Motorola Inc., Communications and Industrial Electronics Div., 4501 West Augusta Boulevard, Chicago 51, for details on Motrac radiophone.**

•

Spark-plug pressure indicator

. . . shows cylinder pressures precisely. The new SLM spark-plug pressure-gage combination provides continuous, accurate measurements of compression and firing pressures in internal-combustion engines, the maker reports. No modification is needed on the combustion chamber. And no special spark plugs are needed that may alter the combustion process.

The indicator is rugged enough to withstand and indicate detonation and other destructive types of abnormal combustion. It promises to be useful in field maintenance and in fuel-octane rating on both slow and high-speed, internal-combustion engines. The device uses a separate, subminiature quartz gage that mounts in any standard spark plug. Radius of the plug body is increased less than 0.020 in. Damaged or fouled plugs can be easily replaced.

Changes in pressure or pressure rate generate an electrical charge displayed on an oscilloscope screen. One indicator does both. Calibration is by conventional static methods. **Write or call: Kistler Instrument Corp., 15 Webster Street, North Tonawanda, N. Y., for Bulletin PPI-106.**

•

Relief-valve seal stays tight

. . . at pressures to 7,000 psig. An O-ring seal is used. It can be quickly replaced with commonly available O-rings without removing the valve body from the system or readjusting the pressure setting.

The new AGCO Type 3 relief valve is available for pressures between 30 and 7,000 psig. The maker reports it is suited for use on high-pressure helium, hydrogen, and ethelyne systems.

Reset pressure is adjustable. It may be set as close as 3% below set pressure. **Write or call: Anderson, Greenwood & Co., 1400 North Rice Avenue, Bellaire, Tex., for details on Type 3 relief valve.**

RELY ON RYERSON

Carbon steel—bars, structurals, plates, sheets, tubing, etc.
Stainless—pipe, tubing, sheets, plates, bars, etc.
Alloys—pretested, heat-identified alloys . . . case-hardening, direct-hardening, and heat-treated, including Rycut® free-machining leaded alloys.
Industrial plastics—PVC pipe, valves, fittings, sheets, rods, made-to-order parts; rigid Kralastic and flexible polyethylene pipe.

Services—fast, accurate processing—sawing, shearing, slitting and flame-cutting . . . any shape, any size, any quantity.

Whether you need a single item or a truckload, you can rely on Ryerson for prompt, personal attention . . . expert technical assistance . . . deliveries in record time.

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Member of the Milani® Steel Family

Other products include: safety plate • grating • expanded metal • chain • wire rope • reinforcing bars • pipe and tubing • metalworking machinery

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SHOWCASE . . .

New Literature

25-year life communication batteries

. . . are reviewed in new 14-page Bulletin T-532. It covers the use, design, and construction of PlastiCal lead-calcium-grid communication batteries. The batteries have a life-expectancy of 25 years in telephone, carrier, and microwave service, the bulletin states. It includes complete cell data on the line from 50 to 1,680 amp.-hour ratings and curves on discharge characteristics. It also details rack data, accessory details, and a complete listing of the company's sales and service offices. **Write or call: C&D Batteries, Inc., Conshohocken, Pa., for Bulletin T-532.**

Water softener Bulletin 4530A

. . . now available is an eight-page booklet detailing the hydrogen zeolite process. The bulletin indicates advantages of the process, its chemistry, and variations in methods of neutralizing mineral acidity of hydrogen zeolite effluent. Types of zeolites are discussed as well as relative advantages and disadvantages of various regenerants. The bulletin also contains a brief description of decarbonators. **Write or call: Cochrane Corp., Philadelphia 32, for Bulletin 4530A.**

Industrial tool catalog

. . . is a hand-tool-buying guide for purchasing agents, engineers, production, and maintenance officials. The 156-page catalog is designed for anyone concerned with the use of hand tools for assembly, maintenance, field service, and original equipment repair kits. The booklet is a handy order guide to answer socket needs of users of power-driven nut runners and impact wrenches. Every type size is tabulated with dimensions and specifications listed clearly. **Write or call: Snap-On Tools Corp., 8028 Twenty-eighth Avenue, Kenosha, Wis., for Industrial Tool catalog.**

Temperature detectors

. . . assemblies, parts, and accessories for temperatures up to 1,000° F. are covered in new 36-page Catalog EN-S4. The elements can be used in petroleum refining, and steam and power generation. A special section describes resistance thermometers for precise laboratory work involving temperatures from —261° to 500° C. The catalog includes a tabular listing

Patented

TRADE MARK TIME TESTED MACCO GAS LIFT REG. U. S. PAT. OFF.

MACCO NORMALLY CLOSED CHECK VALVE

The Macco normally closed, positive, triple seal check valve represents one of the major developments in the evolution of gas lift equipment. It is a 10,000 p.s.i. test, 5,000 p.s.i. working pressure valve which is manufactured with standard ½" pipe thread connections for installation wherever a fine heavy-duty, dependable check valve is required. Their patented design makes them particularly resistant to the ill effects of abrasive erosion and acid.

Installed on Macco gas lift valves this check valve positively prevents back flow of fluid from the tubing to the casing. They also make it possible to acidize the formation or back-pressure the tubing without exposing the casing to either acid or extreme pressures. A scientifically designed hollow "float" allows all of the gas or fluid which passes through the check valve to pass through the lateral openings and hollow stem. This feature provides protection for the spring. Macco check valves are triple seating—first, a metal shoulder on a "resinoid" disc, metal-to-metal under high pressure, and "O"ring seal.

Write for additional literature or information.

MACCO OIL TOOL COMPANY, INC.

1521 Prince — P. O. Box 7288 — Houston 8, Texas

Phone UN 1-1253

NEVER AGAIN!-cut-fit-trim-refit-recut-refit

do it once — do it right!

with the

PAT. NO. 2408517

H & M SHAPE CUTTER

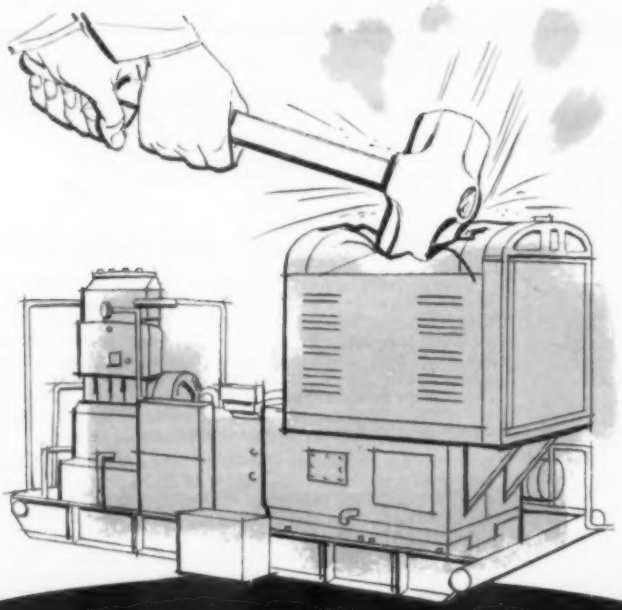
Accuracy in cutting or beveling saddles, tees, els, or other designs has long been a time-consuming, trial-and-error process in pipe fabricating. Today, however, you can produce *precise* cuts and bevels *the first time*—with an H&M Shape Cutting Attachment!

The H&M Shape Cutter is actually steered around the guiding template by exerting the proper spring tension on the sliding torch assembly. The cutting torch is thereby *forced* to reproduce the exact shape desired.

Eliminate those costly "re-cuts" and "re-fits" with an H&M Shape Cutter. Then—do it once, and you've done it right!

FULL DETAILS AVAILABLE IMMEDIATELY

H&M PIPE BEVELING MACHINE COMPANY
311 E. Third St. Diamond 3-0241
TULSA, OKLAHOMA



Don't let this happen to your engines

No one will swing a sledge hammer on your engine *but* here's something just as destructive. Oil pressure failure or overheated cooling water can develop even in the best engine . . . and create serious damage and costly repairs!

That's why *your* engines should be protected by PENN Safety Controls. Then, if water temperature becomes overheated . . . or if oil pressure falls too low . . . the PENN control goes into action! Automatically, it sounds an alarm, flashes a warning light or stops engine operation . . . whichever you choose. The minor trouble then can be investigated and corrected before serious damage develops.

Learn more about this *low-cost* protection for *new and old engines.* Ask your jobber or write to Penn Controls, Inc., Goshen, Indiana.

PENN CONTROLS, INC. Goshen, Indiana

EXPORT DIVISION: 27 E. 38th ST., NEW YORK, N. Y.

AUTOMATIC CONTROLS FOR HEATING, REFRIGERATION, AIR CONDITIONING, APPLIANCES, PUMPS, AIR COMPRESSORS, ENGINES

Oakite ECP . . .

Best way to clean a tower

EXPERIENCE proves that the best way to clean a tower is the Oakite ECP way . . . which recommends chemical circulation. For one scale-choked absorber, it meant only 32 hours off-stream. The tower was thoroughly cleaned in 3½ days *less* time, at $2,250 less direct cost than by previous methods.

Developed specifically for your refinery, an Oakite ENGINEERED CLEANING PROGRAM takes into account your soil problems, cleaning needs and available equipment. It makes individual cleaning recommendations for everything from tank stripping to tower turnarounds. It puts "do-it-yourself" cleaning on a practical, profitable basis.

The Oakite Engineer follows through with technical service. His personal help assures satisfaction with results. Behind him stands the finest chemical cleaning research facilities in existence. Call him in. Or write for bulletin. Oakite Products, Inc., 39 Rector Street, New York 6, N. Y.

OAKITE. ECP your economy key

In our 50th year

of specifications by application and design. A listing of accessory equipment for complete control systems and laboratory work is also covered. **Write or call: Leeds & Northrup Co., 4934 Stenton Avenue, Philadelphia 44, for Catalog EN-S4.**

Condulet breathers and drains

. . . to remove moisture from electrical systems are described in new Bulletin 2702. The Type ECD breathers, drains, and universal breather-drain prevent formation of mildew in explosionproof equipment by ventilating and draining enclosures, the bulletin says. **Write or call: Crouse-Hinds Co., Syracuse 1, for Bulletin 2702.**

Compression packings

. . . available on the roll or as precut gaskets in natural rubber, synthetic rubber, compressed rubber and asbestos, laminations, and vegetable fiber are described in a new catalog. The condensed catalog is designed to simplify and speed selection of packings. **Write or call: E. F. Houghton & Co., 303 West Lehigh Avenue, Philadephia 33, for Val-Pac Packings Catalog.**

Firebrick technical-data card

. . . summarizes all of the technical data published previously concerning Babcock & Wilcox firebrick. Called Bulletin R-52, it's printed on card stock and three-hole punched for easy inclusion in technical notebooks. It's handy for ceramic engineers, brickmason superintendents, and others concerned with refractory maintenance and specifications. **Write or call: Babcock & Wilcox Co., 161 East Forty-second Street, New York 17, for Bulletin R-52.**

Indicating Flowrator meter

. . . that features snap-in construction is detailed in new specifications Sheet 10A2700. The snap-in tube construction eliminates the need for operating and maintenance adjustments. It has no packing or stuffing boxes. **Write or call: Fischer & Porter Co., 784 Jacksonville Road, Hatboro, Pa., for Spec Sheet 10A2700.**

Statistical charting methods

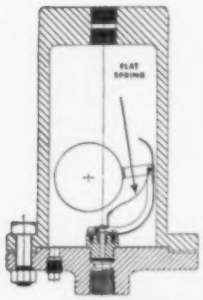
. . . are reviewed in a new 16-page booklet. Built around the use of Graph-A-Plan charting materials, it lists seven steps for good charting. The booklet also outlines the various types of charts and graphs generally used in business and industry. Included are discussions of horizontal and vertical bar charts, line or time-series charts, pie charts, and area charts. **Write or call: Labelon Tape Co., Inc., 450 Atlantic Avenue, Rochester 9, for Statical Charting booklet.**

Liquid-level gage

. . . for overhead fuel tanks is described in new four-page Folder T-58. The new gage consists of clear plastic tubing mounted vertically on the outside of a tank. It can be read from the ground. The gage can be installed in 5 to 15 minutes on any type of overhead tank, the bulletin says. Styles are available for either ¾ or 1-in. tank outlets. **Write or call: Byroad Mfg. Corp., 426 South Hancock, Indianapolis 22, Ind., for Folder T-58.**

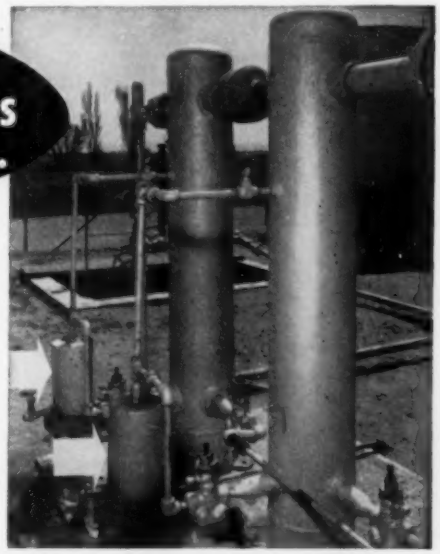
Short-tension packer

. . . is covered in a new four-page bulletin. It's a short packer designed for use in water flooding, acidizing, fracturing, and other below-packer pressure applications. The bulletin includes an outline of applications and con-



TO DRAIN WATER FROM GAS SYSTEMS Safely, without Gas Loss...

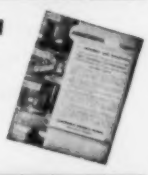
use ARMSTRONG "SNAP-ACTION" TRAPS on Scrubbers, Drip Pockets, Aftercoolers



HERE'S a dependable, positive-acting trap: when sufficient water accumulates in the trap to float the ball and overcome the tension in the bowed flat spring shown in the drawing above, the spring snaps the valve wide open. As water shoots out the float drops, bending the spring until it snaps the valve shut. Thus, with the valve either wide open or tightly closed there is no hunting or dribbling nor will fine dirt particles prevent the valve from seating tightly. You get fast, automatic drainage with no gas loss. These traps have been widely proved in gas system and compressed air service and are *guaranteed* to satisfy. Body and cap are forged steel for working pressures to 1000 lbs. Valve and seat are hardened chrome steel; other interior parts are corrosion-resistant stainless. Ask your local Armstrong Representative for additional details and prices on the No. 71-315 trap.

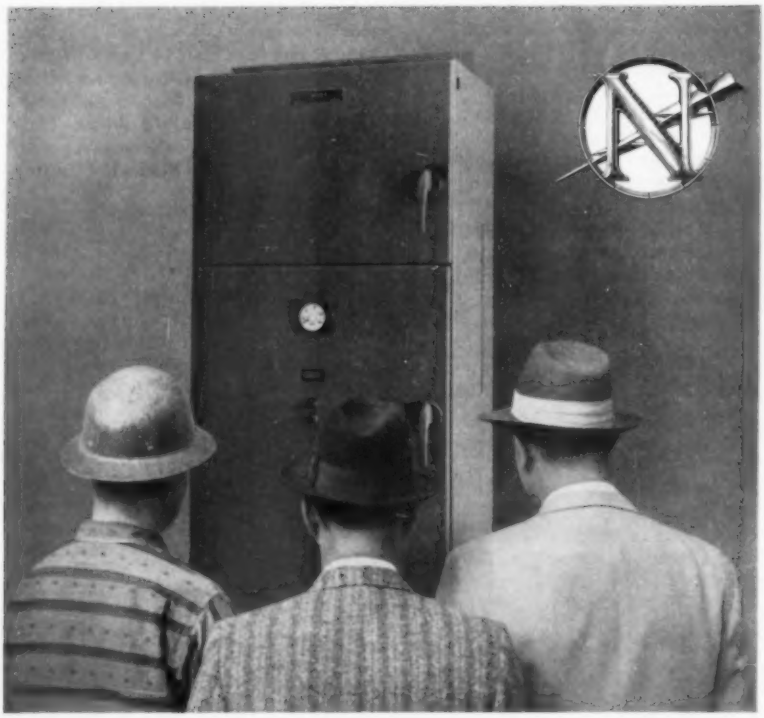
SEND FOR BULLETIN

Bulletin No. 289 gives complete information on Armstrong "Snap-Action" and regular ball float traps as well as on Armstrong Inverted Bucket Traps for draining water from gas. Ask for a copy.



ARMSTRONG MACHINE WORKS
8688 Maple Street • Three Rivers, Michigan

ARMSTRONG GAS TRAPS



The fascinating story of the three hats

"I'm a field man. My job includes installing and maintaining our electrical equipment. That's the reason I like Nelson. You don't have to be an M.I.T. grad to figure out how to install their stuff. Their design makes my work easier when routine maintenance is necessary."

"I'm an electrical engineer. I like Nelson, too. The equipment I specify must operate efficiently and be perfectly reliable. Trouble-free components are a must. I have no doubts when I specify Nelson."

"I'm a purchasing agent. I buy only quality equipment. Prompt action on my purchase orders is essential to me. Nelson acknowledges my orders promptly, and their production scheduling assures me of on-time delivery. Nation-wide field service leaves no doubt that they take care of their customers."

May we suggest that you, too, learn more about Nelson and their complete line of electrical control equipment for industry.

a major source of electrical control equipment for industry

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

struction features, complete engineering data, parts list, and instructions on redressing procedure. Also included are full setting and pulling procedures with a table of surface-setting strokes necessary to obtain desired tension load on the packer. **Write or call: Guiberson Corp., P. O. Box 1106, Dallas, for short-tension packer bulletin.**

Pneumatic-electronic control device

. . . said to detect and control changes in media level with high precision is detailed in new four-page Technical Bulletin RF-587. The Pneutronic level controller comprises a complete system for level control in a variety of liquids and granular media through precise pneumatic pressure output. It's said to be valuable for use in vessels or small tanks which do not permit internal installation of conventional systems requiring large detection devices. It's available with weathertight or explosionproof control housings. Types are available for either overload or underload control. **Write or call: Robertshaw-Fulton Controls Co., 401 North Manchester, Anaheim, Calif., for Bulletin RF-587.**

Automatic Controls Catalog 26

. . . is now available. The 52-page catalog describes and illustrates a line of electric thermostats, pressure controls, humidistats, and motor-operated valves. It also includes regulators, motor operators, unit ventilator controls, hot-water controls, electronic controls, controls centers, and accessories. Operational and application data are incorporated with the description of each control component. **Write or call: Barber-Colman Co., 1300 Rock Street, Rockford, Ill., for Catalog 26.**

Chemical-resistant finishes

. . . are illustrated in a new color-card folder. Six Val-Chem coatings are illustrated for all conditions of application. These include modified chlorinated-rubber enamel, epoxy enamel, urethane enamel, chlorinated rubber enamel, epoxy-ester enamel, and vinyl coating. The coatings are available in 11 colors as well as white and black. The folder includes complete information on the procedure for applying each coating, as well as product numbers to simplify ordering. **Write or call: Valdura Paint Div., American-Marietta Co., 101 East Ontario Street, Chicago 11, for Val-Chem color card folder.**

Which phosphorus additive for gasoline?

Monsanto can "unroll" for your inspection a whole series of gasoline-soluble organic phosphorus compounds . . . can show you new proof of effectiveness and economy . . . will "tailor" new blends or even new compounds for your stocks. And, of course, being basic in phosphorus and the attendant organic chemicals—Monsanto can supply phosphorus gasoline additives in tank cars at the most attractive prices.

Answers

TO TWO CRITICAL QUESTIONS

What additive and how much of it will make a true multi-purpose gear lube WITH good controlled limited slip differential properties?

Monsanto's SANTOPOID 23-RI is proving to be the best, most economical additive for this type lubricant. The level of additive to meet new specifications has been determined and the cost/performance ratio is quite attractive. Corrosion inhibiting properties are outstanding. To prove this, discuss running an early qualification test in your base stocks with your Monsanto representative.

Monsanto invites your inquiries on either or both of these questions. A "team" of phosphorus chemistry experts will be happy to work with you. And Monsanto's expanded gear-lube testing facilities can quickly prove the value of SANTOPOID 23-RI in your base oils.

MONSANTO CHEMICAL COMPANY
Petroleum Chemicals Department
Lindbergh & Olive Street Roads
St. Louis 24, Missouri

Santopoid: T. M. Monsanto Chemical Co.

Monsanto®

Line pressure seals Mission Valves. Sealant is applied automatically under pressure from the line product itself. Because of this positive seal, leaks are literally stopped before they start. Yet, because of the split cylindrical rotating gate design, there is no wedging, no sticking, as in conventional plug valves.

The complete line of 315 all steel Mission Valves brings the positive advantages of this exclusive and proved design to practically all valve applications. Eight basic valve sizes from 1 to 6 inches are available, both threaded and flanged ends, either ASA or API flanges, either full or regular opening valves. Twelve pressure ratings meet all requirements, 720 lb. up to 15,000 lb. and at temperatures up to 350°F.

Special purpose valves, such as non-lubricated valves, power-operated valves, parallel string valves, control valves, valves with special end connections, complete the line.

Mission can take care of most of your valve requirements now with leak-proof, easy-to-open, easy-to-close valves. Specify Mission and eliminate your valve problems.

Nothing but the finest will bear the name of

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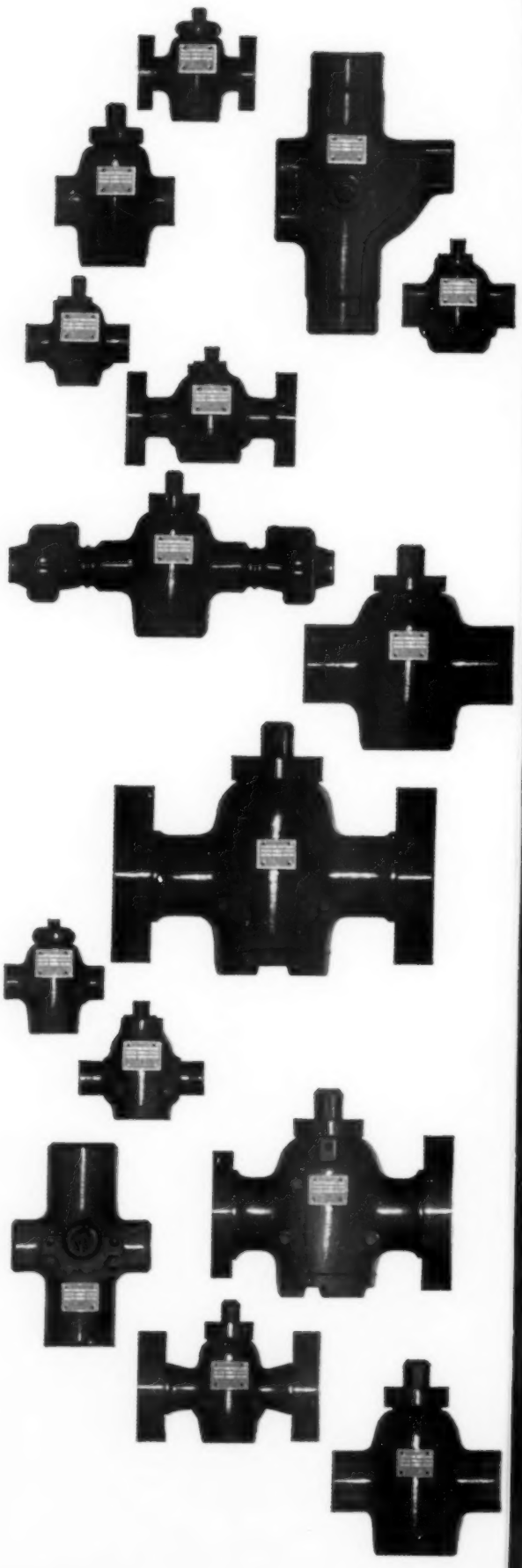
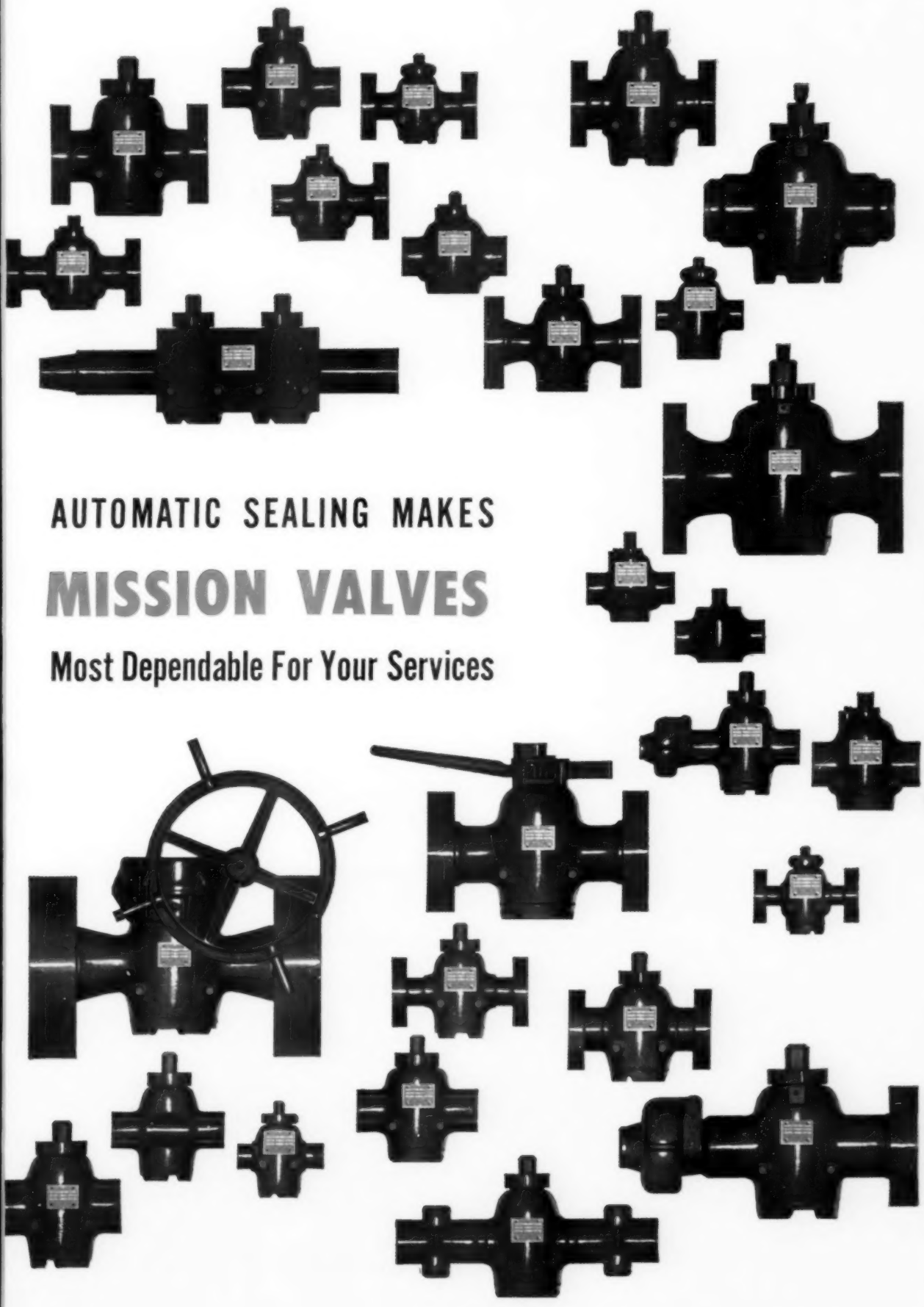




AUTOMATIC SEALING MAKES

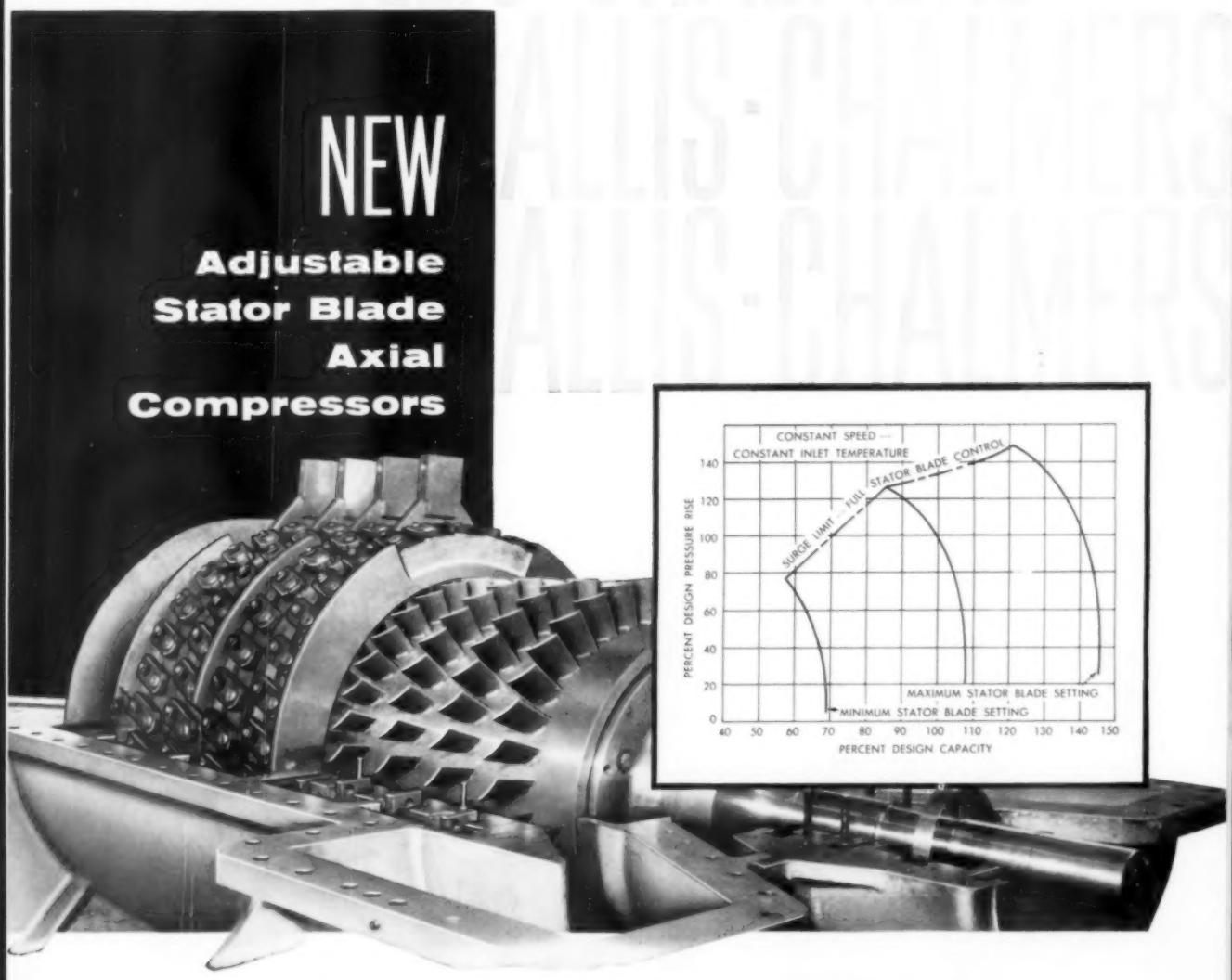
MISSION VALVES

Most Dependable For Your Services

Plan to stay ahead... MODERNIZE!

NEW

Adjustable Stator Blade Axial Compressors



Get wide capacity range at high efficiency

WITH adjustable stator blade control, now available on Allis-Chalmers axial compressors, varying capacity needs can be met by merely changing stator blade settings — while the machine is in operation. Limited operating range need no longer be a problem.

In fact, Allis-Chalmers axial compressors can now be used with almost the same capacity variation as the centrifugal, while maintaining the axial's characteristic high efficiency and pressure rise at part load points.

For details on the adjustable stator blade axial compressor, call your nearby A-C office, or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

These additional advantages are inherent in axial compressor performance:

1. Because of the axial's wide range at constant speed, either steam turbine or motor drive can be used.
2. Small size, light weight of axial units cut space requirements, reduce foundation size and cost.
3. High compressor efficiency reduces horsepower required in driving an axial as much as 12%, compared with other compressor types.

ALLIS-CHALMERS A-C ALLIS CHALMERS

A-5839

Los Angeles Nomads host international guests

. . . at the September meeting. Standing are: F. N. Willey of Kuwait Oil Co. from Kuwait; C. N. Huff, Tidewater Oil Co. from the Middle East; Dick Hoerner, speaker; and A. F. Driskill, retired from Iraq Petroleum Co. Seated are Howard Bryan of Dunlap & Graham from Uruguay; Cordell Vincent of I.O.E.P.C. from Iran; and A. J. Hood of Santa Fe Drilling Co. from Iran.

Hughes Tool Co. announces

P. L. Myers

. . . reorganization of its sales personnel, according to M. E. Montrose, vice president, sales. Park L. Myers has been made manager of United States and Canadian sales, and E. M. Connor manager of export sales. Both are under W. H. Siems, general sales manager. Export sales activities have been divided into Western and Eastern Hemisphere territories with O. B. Latrobe, New York, heading Western

E. M. Connor

O. B. Latrobe

Hemisphere sales and R. G. Roberts, London, Eastern Hemisphere sales. J. R. Lesch moves to Houston as manager, rock bit sales. R. W. Lewis becomes manager, tool joint sales. Leon Stinson moves to Houston as director of sales training.

Seven new regional headquarters with respective managers are: Dallas, T. G. Whiddon; Houston, W. W. Hampton; Denver, S. J. Lintzenich; Midland, M. A. Foreman; New Orleans, F. T. Alexander; Tulsa, H. M. Kelley; and Canadian, R. D. Hood.

R. G. Roberts

J. R. Lesch

R. W. Lewis

Leon Stinson

W. R. Barry joins

. . . Philip L. McLaughlin & Associates, Dallas, Tex. Barry will head a newly-established product design group, which will complement a sales research and market planning division, to be guided by McLaughlin. The firm also announced a name change to McLaughlin & Barry, Consultants. The company will specialize in engineering and marketing consultation services for new products and the redesign and modernization of existing products marketed to the petroleum industry.

Link-Belt Speeder Corp. names

. . . two men to new sales managerial positions, reports C. M. Basile, vice president of manufacturing and sales. N. V. Chehak has been named sales manager in charge of all domestic and Canadian sales. D. F. Van de Roovaart has been named assistant sales manager for all domestic and Canadian sales.

Liberty Mutual offers

. . . the first package insurance plan ever made available for drilling contractors. W. R. Newton, vice president of Liberty Mutual Insurance Co., said that the new package includes workmen's compensation, general liability, and fleet insurance, and features a new physical damage policy to cover drilling rigs. It also offers drillers complete protection in depth in that it carries the use of Liberty Mutual's staff of loss prevention specialists. These trained engineers will work with rig operators in eliminating job hazards, establishing simple and effective safety programs, and training drilling crews in emergency procedures.

W. A. Davidson appointed

. . . assistant sales manager at Herb J. Hawthorne, Inc., according to Jack W. Thigpen, vice president of sales. Davidson joined the Hawthorne sales staff as a sales representative in February, following 11 years with an oil industry supply firm.

W. A. Davidson

J. E. Shoemake appointed

J. E. Shoemake

. . . as manager, refinery and pipeline equipment sales of U. S. Steel's Oil Well Supply Division, according to M. F. Hazel, vice president, sales. Shoemake will locate at Houston. He has been with Oilwell since 1945.

Continental-Emsco Co. names

. . . L. Z. Bolding as store manager at Oklahoma City. He was formerly store manager at Liberal, Kans. F. R. Johnson, former field salesman at Russell, Kans., has been promoted to

IN NIOBRARA COUNTY, WYOMING, the acid-oil emulsion used in Acid Petrofrac gives excellent results in the first Leo sand at about 5400 feet. 5000 gallons of this emulsion is generally recommended for pays 50 to 75 feet thick. The treatments usually cost less than $3000. Some have resulted in 100 bopd production. Payout is often less than ten days.

ACID MAY BE YOUR BEST WELL STIMULATION "BUY"

Inhibited acid has long been one of the most effective fluids for stimulating production from oil and gas bearing formations. Many thousands of wells have been brought in as healthy, high-profit producers through its use. Often inexpensive, small-volume acid jobs have given outstanding production increases.

Today, acid is even more effective—because of the application techniques and the acid addition agents developed through Dowell research. When you have a well stimulation problem, it makes sense to *consider the use of acid first*—by itself or in conjunction with a fracturing treatment. Acid is proving to be the most versatile of all well treating fluids.

For example, acid is no longer confined to just the highly soluble formations like limestone and dolomite. Conglomerate, chats and some sandstones frequently contain appreciable amounts of soluble materials. Dissolving these deposits is often the best way to increase permeability and ultimate recovery. Also, the highly soluble limestones that previously required constant attention and frequent reacidizing, can now be treated with Retarded Acid to help get deeper penetration and extended drainage areas.

Mud Acid, Stabilized Acid, Silicate Control Acid, Channeling Acid, Acid Petrofrac®, Breakdown Acid —and a host of other Dowell tailored acid services and acid-base fracturing services—are helping unlock problem formations that heretofore were unprofitable.

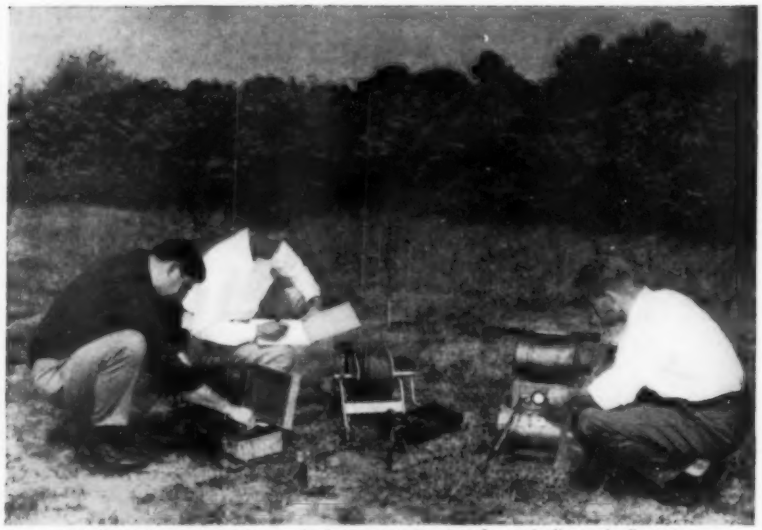
When faced with a treating problem on either a new or an old well, consult your Dowell engineer. Let him help you decide on the best treatment. Take advantage of the 25 years' experience of the people who *first* brought acidizing to the oil fields. Call any of the 165 Dowell offices and stations. In Canada, contact Dowell of Canada, Ltd.; in Venezuela, contact United Oilwell Service. Dowell, Tulsa 1, Oklahoma.

Services for the oil industry DOWELL

A SERVICE DIVISION OF THE DOW CHEMICAL COMPANY

IN RED DEER, ALBERTA, CANADA, the highly-soluble Sundre Mississippian lime responds well to a specially-tailored Dowell acid. Preferred treatment for this 9300-foot pay zone is 6000 gallons regular Dowell X Acid with agents added to reduce surface tension, reduce silicate swelling and prevent emulsions. Treatment is usually performed down tubing at pressures of 2500-4000 psi.

IN KNOTT COUNTY, KENTUCKY, Stabilized Acid —an exclusive Dowell service—has proved successful in the Big Lime Field, where many wells have actually shown decreased production when treated with other acids. Dowell uses 2000 gallons regular acid, followed by 2000 gallons of acid containing a special stabilizing agent. This relatively low-cost treatment is being accepted as standard in the field.



E. R. P. engineers use modern methods to get design data for a pipeline cathodic protection system. This group is making current requirement tests for designing a ground bed.

E.R.P. DESIGNS CATHODIC SYSTEMS
That Give Maximum Pipeline Protection

E. R. P. corrosion engineers are trained specifically in cathodic protection techniques. They evaluate all pertinent data *before* designing a pipeline cathodic system. *After* design and installation, continued E. R. P. surveys help maintain the efficiency of the system. They warn of environmental changes that affect complete protection.

Cathodic protection is, after all, like any tool. It requires skill and knowledge to use the tool successfully.

The cost of a cathodic system should always be measured by the savings achieved through maintaining full corrosion control, not just by the first cost of the system. On this basis E. R. P. designed cathodic systems give maximum savings for each dollar spent. For full information about E. R. P. cathodic protection for pipelines write for Bulletin E-43.

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A SUBSIDIARY OF WALLACE & TIERNAN INC.
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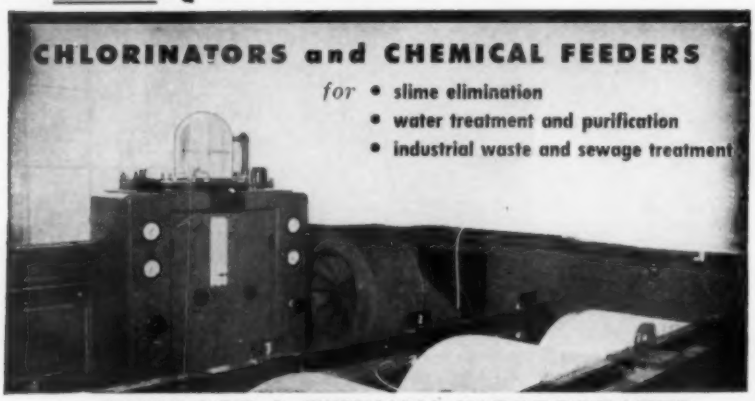
CABLE: ELECTRO, NEWARK, N. J.



WALLACE & TIERNAN INCORPORATED
CD-41.66 25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

store manager there. J. W. Armstrong has been transferred to Liberal as store manager. D. F. Barton is district D+B specialist at Oklahoma City. He transferred from Healdton, Okla. J. S. Robertson becomes D+B specialist at Winnsboro, Tex.

Jack C. Norton joins

. . . Tyson Smith Co. as sales manager for the oil and gas division. He will headquarter in Houston. He formerly was manager of export sales for Oil Center Tool Co.

Frank Wheatley Pump names

. . . James H. Withers & Co. as its manufacturers' representative on the West Coast, according to Frank Wheatley, Jr., president of Frank Wheatley Pump & Valve Manufacturers. The new representative will handle the entire Wheatley line. The office of the representative is in Long Beach, Calif.

J. H. Withers

Robert E. Stewart joins

. . . Empire Geophysical, Inc., as district engineer, logging division, with offices at Odessa, Tex. He formerly was a sales engineer at Midland, Tex., for Halliburton Oil Well Cementing Co.

Jack Ergle joins Datics Corp.

Ergle will handle client liaison and computer programing of problems in chemicals, thermodynamics, and the process industries. He was formerly with Phillips Petroleum Co.

Shields-Harper & Co. named

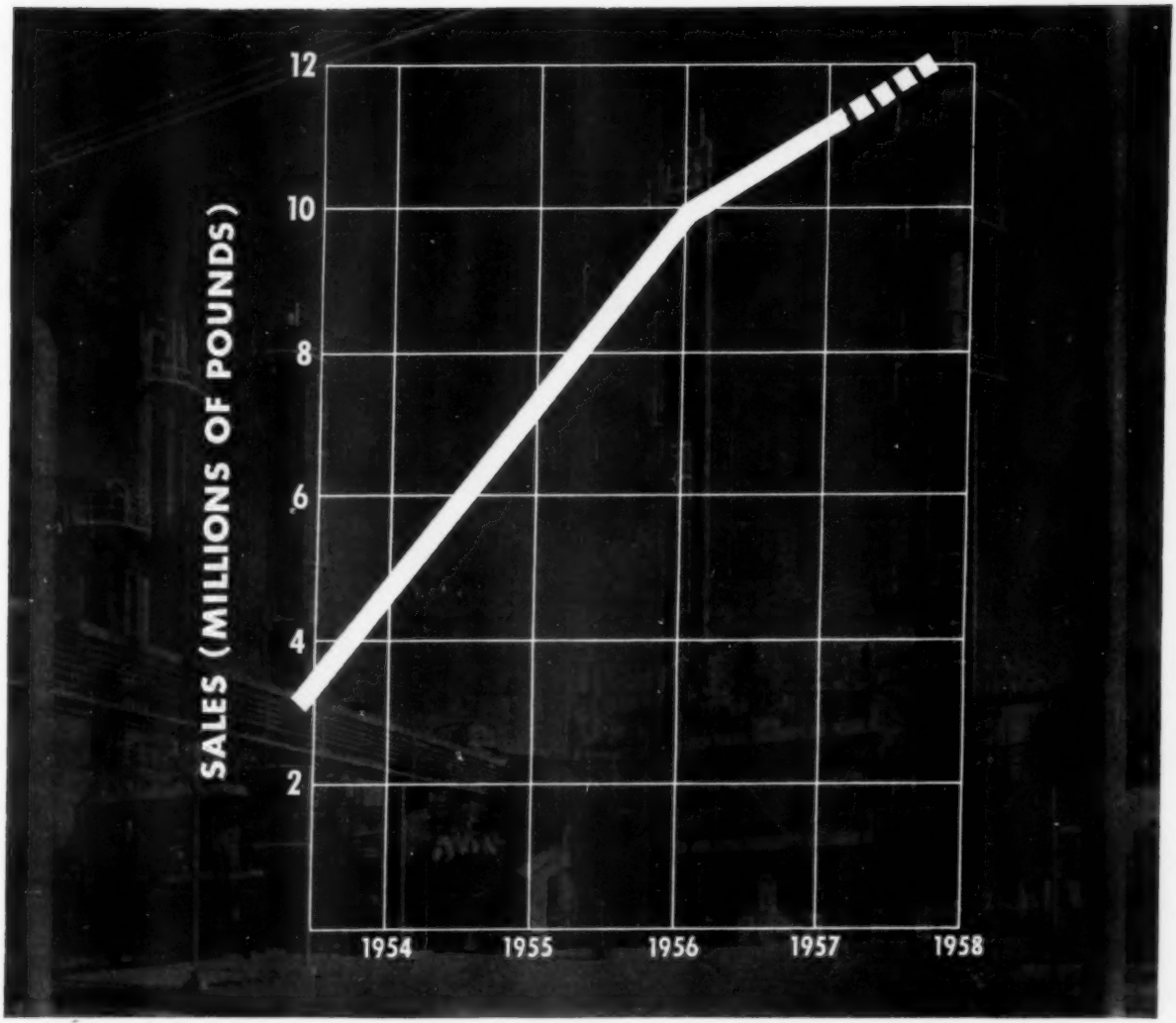
. . . as distributors of Ever-Tite couplings, adapters, nozzles, and other products on the Pacific Coast by Ever-Tite Coupling Co., Inc., according to John T. Krapp, president of Ever-Tite.

Industrial Supply Co. opens

. . . a new sales office in Amarillo, Tex. John E. Ryan, former resident manager of the Fort Worth sales office, has been appointed as resident manager of this office. Will W. Brooks has been appointed as new resident manager in Fort Worth.

Motorola, Inc., names

. . . Henry Gammell as international sales manager for all communications and industrial electronics products manufactured by Motorola, including two-way mobile radio and microwave.



GOVERNMENT FIGURES PROVE AMAZING GROWTH OF DALPAC-TYPE ANTIOXIDANTS

Figures of the U. S. Tariff Commission show the astounding growth of di-tert-butyl-p-cresol in just three years—almost tripled!

Dalpac 4, Hercules di-tert-butyl-p-cresol, has firmly established itself as a leading antioxidant in many industries where hydrocarbon stability is a problem. Petroleum refiners, for example, rely on Dalpac to inhibit gum formation, stabilize gasoline color and prevent engine deposits. They use it in turbine and transformer oils to prevent deterioration. Dalpac 4 has no effect upon electrical properties, which makes it ideal for use in transformer oils.

These are but a few indications of where this Hercules antioxidant can serve you. Since Hercules is a basic integrated producer starting with the raw material, you can count on a dependable source of supply. We will be glad to answer your inquiries and send technical information.

DALPAC® 4

Oxychemicals Division • Naval Stores Department
HERCULES POWDER COMPANY
INCORPORATED
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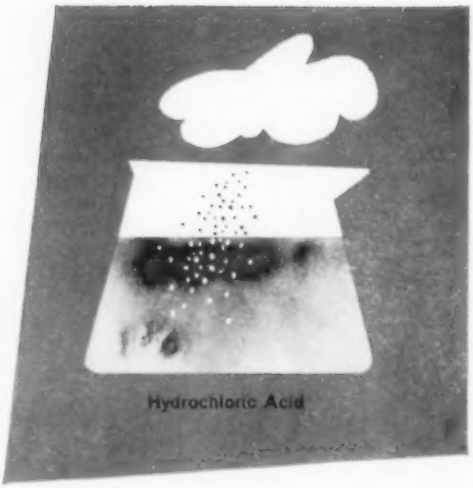
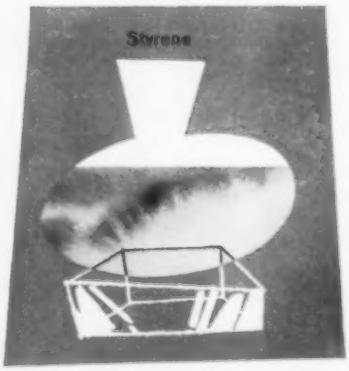
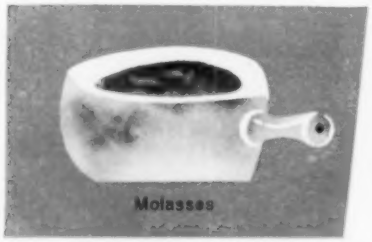
which of these
can't be stored in a
GENERAL AMERICAN TERMINAL?







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Six "problem" products! Yet each can be stored safely and economically at General American Tank Storage Terminals.

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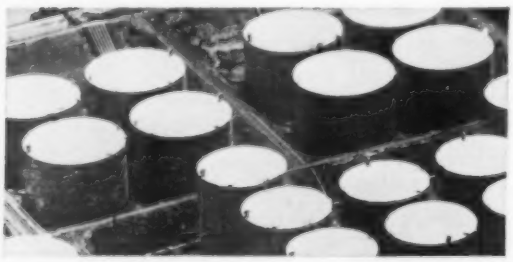
General American Tank Storage Terminals offer you the privacy, safety, service and flexibility of your own terminal—*without capital investment on your part.* Write or phone—today. You'll find... *it pays to plan with General American.*



Six terminals at 5 key-market locations with over 14,000,000 barrels capacity: PORT OF NEW YORK (Carteret, N.J.), PORT OF NEW ORLEANS (Good Hope, La.), CHICAGO, ILLINOIS (Bedford Park), PORT OF HOUSTON (Galena Park and Pasadena), CORPUS CHRISTI, TEXAS.

GENERAL AMERICAN TANK STORAGE TERMINALS

a division of GENERAL AMERICAN TRANSPORTATION CORP. *135 South La Salle Street • Chicago 90, Illinois*

TANK STORAGE TERMINALS GENERAL AMERICAN TRADE MARK

James Stewart was named assistant to Gammell; and John Dabrowski was appointed radio communications representative in Latin America.

Don D. Hampton appointed

. . . as head of the Denver sales office of Instruments, Inc. He was formerly with the plastics division of National Tank Co., parent company of Instruments. He will be in charge of all sales in the Rocky Mountain area. He was formerly employed by Refinery Supply Co. and also the cellophane division of E. I. du Pont de Nemours & Co., Inc.

Blaw-Knox Co. appoints

. . . James T. Langham of James T. Langham & Associates, as sales representative for Blaw-Knox gas cleaners in Oklahoma, Louisiana, and Texas. Headquarters are in Dallas, Tex.

Bucyrus-Erie Co. establishes

. . . a West Coast district sales office in South San Francisco, Calif. H. R. Langford has been appointed West Coast district representative, according to S. A. Stone, water and oil well drill sales manager. Langford joined Bucyrus-Erie in 1939.

Ogilvie and Rabey join

. . . Geoprosco, Ltd., London. W. P. Ogilvie is seismic technical manager and W. N. Rabey is executive assistant. Ogilvie was supervisor of seismic operations for Accurate Exploration, Ltd., Edmonton, Alta.; and Rabey was formerly manager of Accurate Exploration.

Charles F. Sarratt becomes

. . . vice president and member of the board of directors of Chris Well Servicing Co., according to Ray E. Christian, president. Chris Well, headquartered at Lindsay, Okla., carries on well completion and workover operations. Sarratt has been division salesman for Christensen Diamond Products Co.

Dow Chemical Co. announces

. . . the formation of an overseas subsidiary company in Venezuela to handle its international operations. The subsidiary, Dow Chemical International, Ltd., S.A., will consolidate overseas sales of Dow products and administer the company's business interests and investments abroad. Dr. L. I. Doan, president of Dow, was

• Year after year, trucks have been called upon to carry heavier loads in all phases of petroleum operation. And yet, while load sizes have skyrocketed, the size of chain necessary to do a safe, effective tie-down job has remained nearly the same. Ever wonder how this can be? It's due primarily to technological advancements in the manufacture of chain from better grades of steel which make it possible to move heavier loads faster at no appreciable increase in chain size or weight. • An outstanding example of such a chain is ACCO Boomer Chain. Made from High Test Steel or Accoloy steel in 20-foot lengths, they have drop-forged Alloy Grab Hooks (I-Beam Type) on each end. The hooks are factory attached and factory proof-tested. High Test Boomer Chains come in six sizes, from ¼" x 20 ft. through ⅝" x 20 ft. Chains of Accoloy are made in four sizes, ⅝" x 20 ft. through ⅞" x 20 ft.

ACCO

American Chain Division
AMERICAN CHAIN & CABLE
Bridgeport, Conn. • Factories: *York and *Braddock, Pa.
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ACCO for Better Values

NO LUBE MAINTENANCE..
TIGHT SHUT-OFF...
POSITIVE OPERATION

PERFECT for Automatic Custody Transfer!

DeZurik Control Valves completely eliminate problems that can arise with other valves on A.C.T. For instance, DeZurik Valves need no lubrication to deliver dead-tight shut-off; they respond **instantly** to control signals. Get the complete story from the DeZurik representative in your area, or write for details.

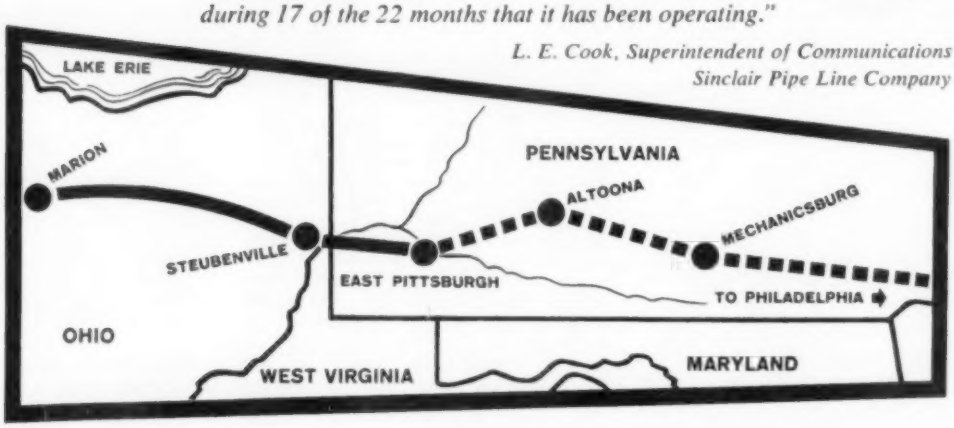
DeZurik Control Valves are available in sizes ½" thru 20", with on-off or positioning pneumatic or hydraulic operators, in a full range of materials.

DeZURIK CORPORATION
SARTELL, MINNESOTA

Kellogg Microwave performs at 99.998% reliability!

"...this system has performed exceptionally well...100% continuity during 17 of the 22 months that it has been operating."

L. E. Cook, Superintendent of Communications
Sinclair Pipe Line Company



Only five outages in the 22 months of service this Kellogg PTM Microwave System has been in operation for Sinclair Pipe Line Company, and only two of these totalling 2 hours and 51 minutes caused by the microwave equipment. That's 99.998% reliability, far superior to physical circuits!

Sinclair's dual path system was inaugurated on October 13, 1956. The present system stretches 200 miles from Marion, Ohio, to East Pittsburgh, Pennsylvania. It features 8 channels, 2 terminal stations, and 7 repeaters. All intermediate stations have drop equipment. At East Pittsburgh, circuits are joined by similar Kellogg 10C PTM systems extending eastward to Mechanicsburg then to Philadelphia.

Sinclair's dual path operation between East Pittsburgh and Marion, Ohio has many advantages over conventional systems, principally the elimination of all switch-over equipments or circuits. A failure of one of the units will not interrupt traffic, hence there is no traffic time loss as a result of switching to standby. There is increased reliability since both operating units are continuously monitored for condition of operation. Space or frequency diversity equipments may be operated with a minimum of additional components. In addition to this high degree of reliability and continuous performance, Sinclair reports that "the signal-to-noise measurements have exceeded the original calculations and the system has provided excellent performance since the inaugural date of operation."

The Kellogg Model 10C-2 PTM Microwave System now features up to 45 channel multiplexing equipments. Channels are readily arranged to suit the needs of specific installation whether for telemetering, remote control, data and voice transmission. Our engineering staff is always at your service ready to discuss your communication problems.

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Why Kellogg PTM Is Setting New Performance Standards:

Microwave has made huge strides since first pioneered by International Telephone and Telegraph Corporation in 1931. Here are 10 reasons why Kellogg's Pulse-Time Modulation Microwave, perfected by ITT research, is inherently superior.

1 Easy maintenance, particularly of the RF equipment; visual test and check methods may be used.

2 Tubes may be changed at random *without* realigning the Intermediate Frequency Amplifier.

3 Where propagation is a problem due to multi-path cancellation, it is simple to install space diversity reception equipment.

4 Drop channels may be intalled at random, without need to demodulate entire groups to audio.

5 Economical system design: drop and insert channels may extend only throughout those parts of the system where required, and not the entire length.

6 Maximum transmitter tube life; tube life averages approximately 15,000 hours for 2C39s.

7 All PTM channels are interchangeable, only one spare is required.

8 High signal-to-noise ratio: the inherent noise of each channel is "clipped" out. Each terminal and each repeater station transmits a fresh signal.

9 Less tower rigidity required for accurate signal transmission at 2000 mc.

10 Plug-in channel units feature printed circuitry replacing tubes with crystal diodes; demodulators semi-passive, one tube per channel; modulators passive, no tubes. Results in 4:1 reduction in the number of tubes and 5:1 reduction in power consumption.

Investigate these and other advantages of a Kellogg PTM Microwave system. Write for complete details.

named chairman of the board, and C. S. Shoemaker president of the subsidiary. R. F. Kincaid is manager of the office in Caracas.

Hydraquip Corp. opens

. . . a branch warehouse in Dallas, Tex., with Joe Finley in charge, according to D. A. Cameron, general sales manager, Parker-Hannifin Corp. Parker industrial tube and hose fittings will be stocked at the warehouse.

Edward H. Elliott named

. . . industrial sales representative of Warren Pumps, Inc., in the Philadelphia area. He has been a manufacturer's representative in this area since 1954. Prior to establishing his agency, he had been with Fischer & Porter Co. and E. I. du Pont de Nemours & Co., Inc.

Lufkin Foundry now using

. . . a new welding and structural shop to assemble oil-field pumping units manufactured by Lufkin Foundry & Machine Co. One feature of the new building is a 250-ft. floor level conveyor system which moves the equipment along as it is assembled. The building is 110 ft. wide and 500 ft. long.

National Aluminate acquires

. . . Howe-Baker Engineers, Inc., Houston, reports Joseph A. Holmes, president of National Aluminate Corp. Howe-Baker Engineers will operate under its own name as a subsidiary of Nalco and under its present management headed by G. B. Hanson and C. H. Black. Company headquarters have been moved to Tyler, Tex.

Allan Gardner appointed

. . . field engineer for Ralph N. Brodie Co. He will heaquarter in the eastern division office at Mount Vernon, N. Y.

Ansonia announces new pattern

. . . of sales representation for its industrial cable products, according to A. J. W. Novak, general sales manager of The Ansonia Wire & Cable Co. Thirteen representatives are affected by the redeployment, eight of them newly recruited to Ansonia's service. The new representatives are: J. Y. Schoonmaker Co.; Belcher & Associates, Inc.; L. L. Weldy & Associates, Inc.; Zeppenfeld & Co.; George R. Horne Co.; W. W. Hasbrouck Co.; John G. Pettyjohn Co.; and Edgar Hubert Co. Long-time representatives include Paul Berry, Inc.; Hamilton Associates; Gregory-Salisbury & Co., Inc.; Brown Electrical Equipment Co.; and J. T. Hill Co.

Strahman

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Heated or Cooled Gauges

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No need to tell you...

You need a truck that's suited exactly to the heavy-duty hauling demands put upon your equipment. That's why so many operators like you depend on their Macks for the utmost in available power, minimum down time, ease of maintenance and maximum reliability.

Want a quick reason? No other truck manufacturer makes so many of its components, that work together like a top-notch derrick crew. For instance:

MACK-BUILT ENGINES—gasoline or diesel Thermodynes®. Champions all for long life, dependability and fuel economy.

MACK-BUILT TRANSMISSIONS—up to 20 speeds. Remember that Mack transmissions are built to accommodate power takeoff units necessary for oil-field work.

MACK-BUILT BOGIES—Mack alone builds its own tandem rear ends. Mack Balanced Bogie with Power Divider provides power to the wheels with maximum traction—an important factor in your rigorous operation.

You're short on time, sure . . . but it will only take a minute to call your nearest Mack branch or distributor and ask him to verify these claims. He'll give you the names of Mack users in your own area who can tell you their experience with Macks. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd.

MACK

first name for

TRUCKS

Wyoming's "deep" thinking flourishes

BY JOHN C. McCASLIN

ALTHOUGH the completion figures don't show it, Wyoming is providing most of the exploratory excitement in the Rocky Mountains this year. Atlantic Refining Co. and Fremont Petroleum Co. have just given the state and the region their candidate for the year's most significant oil find—O'Brien Springs.

A trend of thought . . . Discovery of Tensleep-Pennsylvanian oil at O'Brien Springs is an outgrowth of a flourishing new era of deep-drilling thinking in the Rockies, particularly in Wyoming.

O'Brien Springs was completed flowing 196 bbl. of oil in 4 hours on ¼-in. choke from perforations at 6,891-7,002 ft., causing renewed reappraisal of one of the most prolific and famous pay zones in Wyoming. The operators also completed in the Nugget-Jurassic for 3,644 M.c.f.d. of gas on ¼-in. choke from perforations at 5,418-72 ft.

This Carbon County unit has been watched closely for the past several months. The first well on the unit found gas production in the Frontier-Cretaceous rocks. That well is 2 miles southwest of the Tensleep hit, the No. 3. The No. 2 well was a failure.

Completion in the Tensleep and Nugget at the third well at O'Brien Springs came after careful scrutiny of the entire section from the Frontier sands at 3,542 ft. to the Cambrian rocks at 7,743 ft. Total depth was 8,100 ft.

Cracks depth barriers . . . The Tensleep success at O'Brien Springs should be symptomatic of what will happen when explorers dig to deeper rocks along the flanks of the many basins in Wyoming. Month-by-month the percentage of deep tests in Wyoming, and indeed in the Rocky Mountains as a whole, has increased appreciably. This deep digging paid off out in the center of the Powder River basin, it paid at Grass Creek, it is opening wide the forbidding doors of the Green River basin, and now Atlantic and Fremont possibly have come up with a major field find in a "no man's land" between the Red Desert and Hanna basins.

O'Brien Springs is of significance for many reasons.

- There is always excitement when Pennsylvanian oil is found in southern Wyoming and northwestern Colorado. Pennsylvanian strata in Wyoming present more problems, and are apparently more complex, than those of most other systems. The various formations in the state are: the Casper of southeastern Wyoming (representing all of Middle and Late Pennsylvanian time, and, extending into the dawn of Permian time); the Hartville which contains Lower Pennsylvanian rocks in the bottom, Middle and Upper Pennsylvanian above, and early Permian beds at the top. The Amsden and Tensleep represent only earlier Pennsylvanian time. Despite the complexity of Pennsylvanian rocks in Wyoming, they are among the most productive. Tensleep produces in a great number of fields, particularly in the Big Horn and Wind River basins; the Darwin (at the base of the Amsden) produces locally in the above basins; the Minnelusa is a big oil getter in the Powder River basin (Lance Creek); while the Casper has some oil in the Laramie basin.
- Very little Tensleep testing has been done in South Central Wyoming. Only Wertz and Lost Soldier fields are major producers in this zone.
- The gravity of the O'Brien Springs oil is 43° . . . exceptionally good for the Tensleep. Most Tensleep oil is of the 20's and early 30's caliber.
- O'Brien Springs apparently adds a significant extension to the southeast-northwest trend of structures that cling to the northeast edge of the Red Desert basin, moving the hunt for Tensleep oil into virgin territory.
- O'Brien Springs should be a starter for a long-needed push into the depths around the sides of **all** Wyoming basins, and should give encouragement to those seeking oil out in the middle of the state's many oil bowls.

THE FINDING OF TENSLEEP OIL at O'Brien Springs is another step in the deep-drilling trend of thought now invading the basins of Wyoming.

Explorationists: you're on the spot!

BY O. C. CLIFFORD, JR.

THERE IS A REVOLUTION in petroleum exploration!

Revolutions are caused by thought, thinking by imbalance. Thinking obviously leads to technologic revolutions. Revolutions take time. Consider the case of the reflection seismograph. In 1917 Haseman and Karcher discussed the possible use of reflected sound waves, previously used to determine ocean depths, to the determination of the location of oil field structures. By 1932 the reflection seismic method was generally accepted as the most dependable method for locating test sites in the expanding search for oil in the United States. Fifteen years had passed since Karcher and Haseman had their initial discussions.

A parallel revolution was initiated by the Schlumberger brothers. In 1927 experimental work began on electrical logging of wells at Pechelbronn, France. A French patent was received on the self-potential method in 1929, the first commercial well surveys in the U. S. were conducted in 1930 employing a single resistivity curve. In 1932 the self-potential curve was added to the Schlumberger log and widespread commercial logging was started.

Profound impact . . . These two revolutionary exploration techniques, the reflection seismograph and the electric log, coming to fruition almost contemporaneously, profoundly shook the geological profession. Like most revolutionary processes they were not completely understood or their limitations appreciated by their originators.

They were even less understood by those to whom they were offered in use. The geophysicist did little in the way of real education. Each company, whether contractor or producer with its own geophysical staff, attempted to cloud in secrecy its own equipment, methods and formulae. In the enthusiasm of new tool ownership, extravagant claims were made. These claims, through ignorance, were generally accepted by producing-department management. Geophysics, whether the gravity, magnetic, or seismic method, was first oversold and then overdiscounted.

The average geologist with his fear of the precision of numbers and his general limited background in physics tended either to accept as gospel the datum points or rates and directions of dip computed by the geophysicist or to dismiss the whole thing as hocus-pocus. He did not want to know what took place in the computing process; certainly he did not want to know that a change of assumptions in the computing process might significantly change that most sacred unit of the subsurface geologist, the closing contour. (And to be scrupulously honest, it must also be said that many geophysicists—particularly of the seismic breed—evaded the question and insisted on presenting their structural interpretations in terms of time, though they well knew that wildcat wells are drilled to depths measured in linear units—feet or meters—and not to depths measured in seconds and milliseconds.)

The average geologist was quite content to depart from the rugged physical effort of field work to the ease and comfort of an office and wait for the geophysicist to hand him a structural map. The only thing the average geologist insisted upon was that once the data had been transmitted to him, he was the only one who had the possible skills and experience to locate the site for test drilling.

This continued uninterruptedly until sometime in the current decade. There was never a suggestion from the average geologist of a change of technique, hardly ever a suggestion of an alternate or new method of finding oil. Option, shoot, and select! Option, shoot and discard! It isn't a very good method but shoot, shoot, shoot!

Electric logging . . . The same general reaction followed the introduction of the electric log. The exploration geophysicist was so enthralled with the delineation of structure by seismic data that he had no time for electric-log research and study. For the geologist, here was another piece of paper with squiggly lines that could be handled in the peace and quiet of an office.

It took from 1932 to the early '50's to shake the belief that electric-log interpretation was simple. In general, it was neither the geologist nor geophysicist who finally woke up to the complexity of the electric log. It was the physicist who had bothered to learn some geology or the petroleum engineer who was anxious to extract the maximum amount of oil or gas from every test drilled who initiated and made the studies.

The exploration profession has been singularly uninterested in what is obviously a very inexpensive method of petroleum exploration—the search for evidences of commercial hydrocarbons as indicated by electric-log data from so-called dry holes—information already bought and paid for!

Other factors . . . While the growth of the reflection seismograph and the almost universal use of the electric log were stultifying exploration thinking on the part of both geologists and geophysicists (because they seemed to solve all problems for the exploration team—made the work too easy!), three other things were happening to petroleum exploration. One was accompanied by wide publicity and fanfare, the other two were almost unnoticed.

The first of these was the inscribing of seismic data in forms other than the conventional oscillograph on

The Author . . .

O. C. Clifford, Jr., is foreign exploration manager for the Atlantic Refining Co., Dallas, and is outgoing president of the Society of Exploration Geophysicists. He has been closely associated with oil-field exploration work for over 30 years. During that time he was employed by several of the major oil companies and was one of the early pioneers in seismic exploration. Since 1936 he has been affiliated with Atlantic. This article is an abridged version of his presidential address presented to the SEG annual convention in San Antonio, October 13, entitled, "The Revolution of Geophysics, 1955. . . ."

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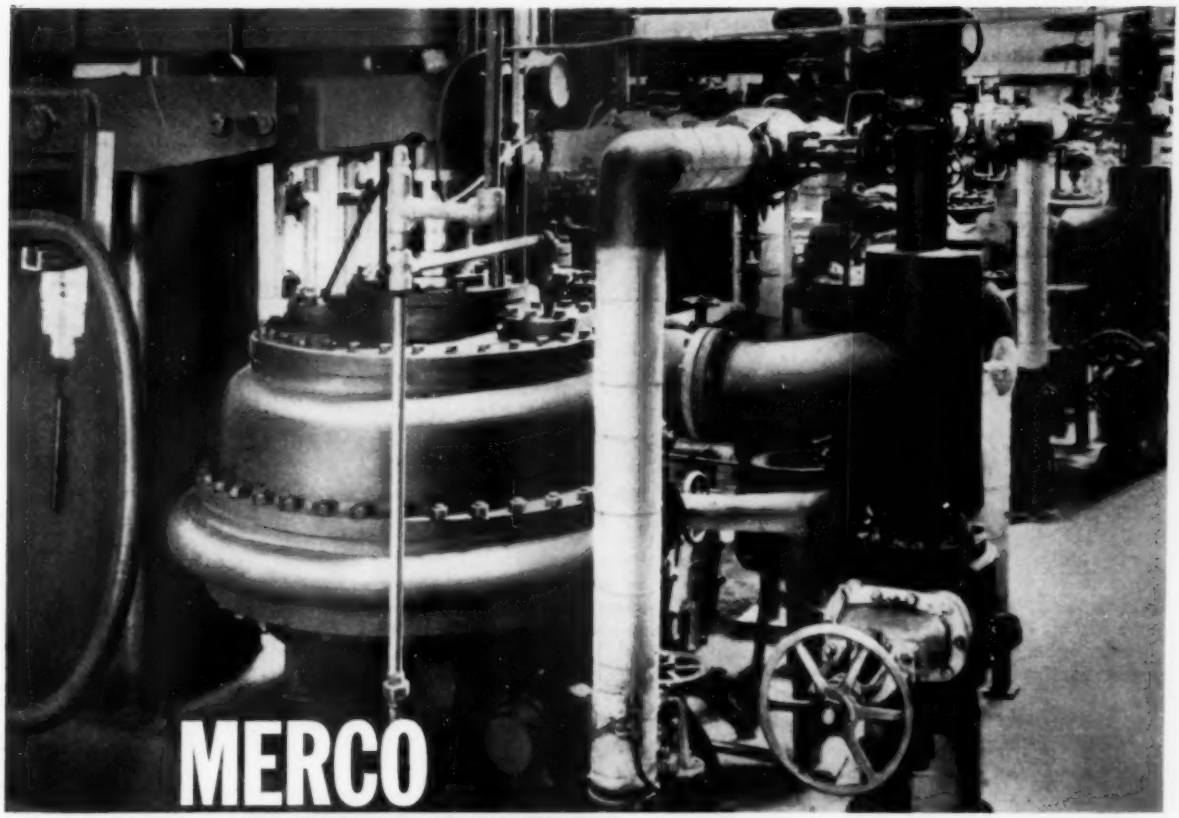

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"... It began to be apparent that the money domestic management was spending on exploratory effort was not producing commensurate profit."

photographic paper. This, of course, had been done by Rieber in the mid-30's with variable-density records on film. But it was not until seismic data could be successfully transcribed onto magnetic tape that it became possible to replay the original field data again and again through a wide variety of filters, superimposing trace upon trace, record upon record, and mechanically or electronically altering the timing of each trace to adjust for differences in elevation, weathering, normal moveout, and velocity distribution.

This, along with rapid developments in both analog and digital computers, permitted the transcribing of individual seismic profiles onto record sections on which the data were reproduced with the bulk of the routine corrections, formerly computed by hand, now being performed by the machine. The end result could be shown as conventional oscillograph traces, variable-area or variable-density presentation, clipped oscillograph, dotted and multiple-dotted traces.

The final section, regardless of its form of presentation, was then touted as a "representation of the layering of the earth itself." At this point we are dangerously near a complete return to the misunderstanding and overselling of the reflection method of the 1930's.

This attitude is not wholesome. We may delude some clients, some nontechnical members of management. But the real danger is in self-delusion. The convergence of two reflection impulses and their apparant merger under shot-point X-1912 does not—repeat, does not—define the position at which a particular sand body reaches its feather edge. Even with the best of velocity information and the most elaborately produced "synthetic' seismograms, the seismologist is a long way from proving his point.

Without doubt, data-processing machines started a revolution in geophysical exploration:

1. Since these machines were essentially custom-made and consequently expensive, there is a marked tendency to remove the interpretational studies of the data from the point of origin to a central location.

2. Since one machine could effectively handle the data collected by several field units, there is a possibility of reducing the total computing and interpretational staff. This, however, may not be true. The greater accessibility and clarity of the data after processing through the machine may encourage more detailed study than formerly, with an increase rather than a decrease in interpretational staff.

3. The scramble for priority with machines-in-being has resulted in a high obsolescence factor. In the desire to be "abreast of the times" with a machine, many rushed into usage equipment with inadequate understanding of what its use would be. And secrecy shrouded lots of effort!

Another revolutionary development was the introduction of continuous-acoustic logging devices. These were recognized by the geophysicist as of vast importance in clarifying velocity-distribution problems. Even though the originators of the equipment correctly labeled them as acoustic, the geophysicist saw only his immediate problem and promptly labeled the resultant log a "continuous-velocity" log. While velocity is important, it is quite possible that other uses to which acoustic response can be put will yield more ultimate profit. The determination of permeability and porosity, even the possibility of recognizing the differences between fluids and gases by acoustic response, may in the long run be of extreme importance. Let us hope the geophysicist will not make the same mistake with acoustic logs that he made with electric logs!

The change in thinking . . . Revolutions are frequently hard to date. There may not be agreement with the date here chosen. Precision is not too critical. About 1955 a different attitude became observable. The curtains of secrecy were parted—slightly it is true—and we began talking again across corporate fences, exchanging experiences, even inviting local societies to visit our laboratories and displaying not only our sophisticated playback efforts but also more esoteric efforts:—continuous-seismic-wave generators, anomaly simulators, velocity contrast versus wave-form generators.

This is obviously all to the good. For, as more of us are exposed to the thinking of others, more of us will be thinking for ourselves and the greater the chance of progress and improvement. In our industry, we must have our thinking geared always to the ultimate goal of our profession. The ultimate goal is not producing elegant and sophisticated machines, necessary as that may be. It is not interpretational legerdemain, as necessary as that, too, may be. Our goal remains finding mineral resources, particularly hydrocarbons, which may be produced at a profit. Never forget that word "profit."

Diminishing returns . . . This brings us to the second of the conditions that affects our way of life and brought on the revolution in exploration. About 1955—and again the date is not too critical—it began to be apparent that the money domestic management was spending on exploratory effort was not producing commensurate profit. New field discoveries which had averaged 11.3 million barrels in 1944 had decreased to 600,000 bbl. in 1957. The cost of finding by geophysical methods had increased from $500,000 per successful prospect in 1944 to $800,000 for the similar success in 1957.

It is one of the disgraces of our profession that it is not we ourselves who have taken the necessary steps to correct our economic failures. It has been the power of the purse or top management that has forced us toward correction. The exploration branch of the domestic petroleum industry did not—except in rare cases—recognize that in continuing to recommend the same programs in the same places year after year without regard to profit, it was exposing itself to curtailment or even to extinction.

The exploration man in this country was pricing himself out of the market. The data on the number of successful wildcats drilled on technical advice tells the story. A peak was reached in 1955-1956, 1957 was down, and 1958 will show a further decline. How severe the drop for '58 will be is today unknown but it will be substantial.

Another index can be found in the number of seismograph crews employed. These reached a maximum of 659 in 1952 and have shown progressively less usage since. The '58 figure will be in the vicinity of 450, a decline of over 30% from the maximum. The 3 to 4-year difference between the apices on seismic usage and technically guided wildcat successes

"... The exploration man in this country was pricing himself out of the market. The data on the number of successful wildcats drilled on technical advice tell the story."

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covers the normal time lag between finding a prospect and being ready and able to drill it.

The failures of exploration people domestically forced a scramble by United States companies into an intensified search for properties abroad. Those already international in character sought expanded opportunities. Many companies previously confined to our own shores joined the stampede across the oceans. According to published reports there were 28 U. S. companies busy with foreign operations in 1946. By 1958 the number had increased to 190.

Whether you like it or not, and no matter what your personal bias is on imports, here is conclusive evidence that the managements of at least 190 companies feel that oil cannot much longer be found domestically in volume to supply our home needs and at a cost competitive with the world market. This remains the case even when considering the tremendous political hazards inherent in many parts of the world today.

This decision has revolutionary impact on those of us already engaged in domestic petroleum exploration or in training for it. First and quite obviously more of us than formerly are going to earn our daily bread across the oceans—or in some other field of endeavor.

Secondly, as the search expands across the waters and is successful, there are going to be fewer of us. Consider just one item. In the free world there are less than 400 rigs available outside the U. S. today in countries where our dollars may be profitably spent. Relatively how many geologists and geophysicists does it take to provide exploratory locations and to guide the development drilling of 400 rigs abroad as opposed to 1,911 rigs at home on September 1, 1958? While unknown, the answer is clearly a small fraction. Today we have almost as many exploration people employed with 1,911 rigs available as we had when 3,021 were available in January 1952. How long can this continue?

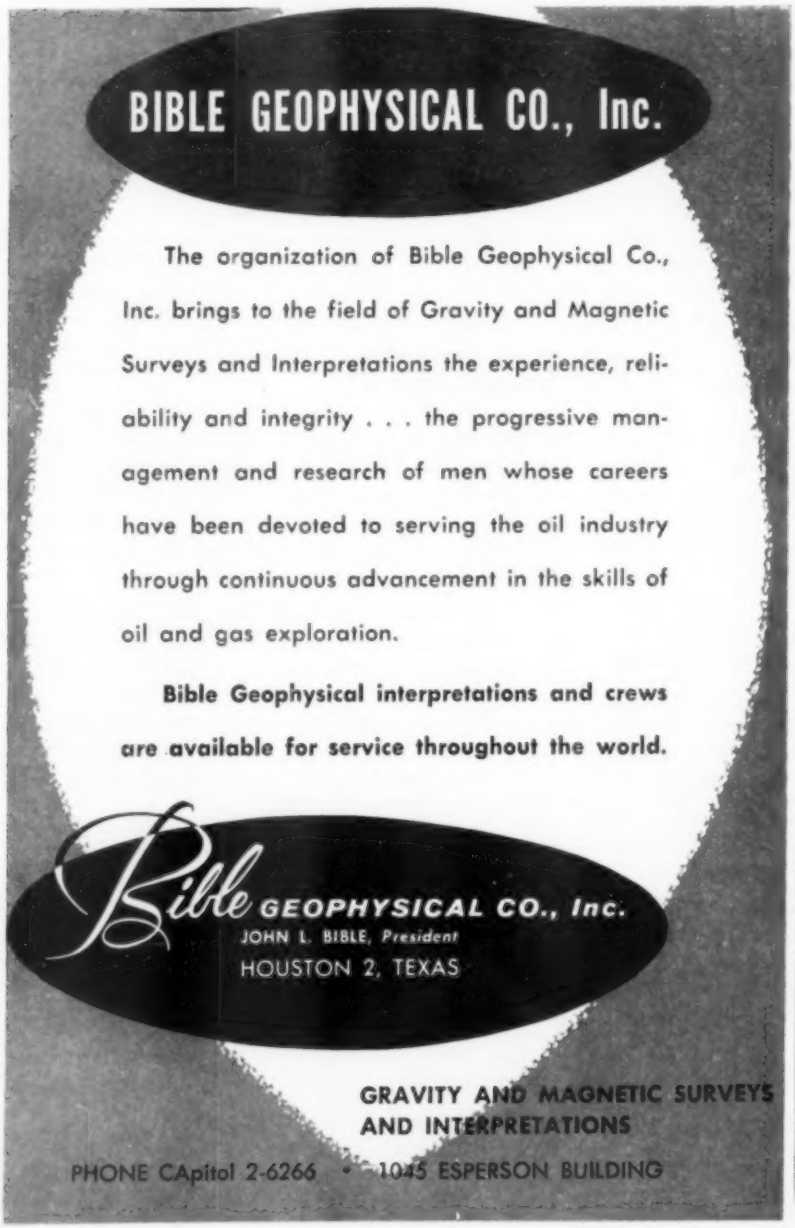
As we go abroad, we are no longer competing chiefly with ourselves for professional employment. Swiss, German, Dutch, English, Russian, and other geologists and geophysicists with at least equal background and equal technical proficiency will be challenging us for employment. This competition will be rugged, intellectually and economically. However, I do not worry about our ability to compete with exploration men of other countries.

There will be rewards for those who accept these challenges and opportunities. The very top positions professionally and managerially will increasingly go to those with world-wide experience and understanding. "World-wide" will also include domestic experience.

Trained scientists essential . . . Without going into detail, it can be stated categorically that to provide the exploratory skills abroad we must maintain healthy exploration training and opportunities, both academically and industrially, at home. Without sacrificing depth in our scientific training, we must increase our breadth in the humanities, particularly in languages and in the knowledge of foreign histories and of foreign cultures.

In our industrial training we must, of course, educate our future expatriates in the latest technologic advances in petroleum exploration and in the ability to foresee what may be required. We must teach how to work efficiently with what is available. This is a discipline we tend to let atrophy here at home. All kinds of special equipment and services are too readily available here.

Soaring costs . . . Returning to the three things that were happening to petroleum exploration between the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30's and the 50's, there remains the final almost unnoticed change. It was double-barreled, and so far has principally affected the seismic branch of petroleum exploration. It has and may increasingly affect domestic petroleum geology. It was said earlier, "the exploration man in this country was pricing himself out of the market." Let us change the sentence to read, "the seismologist in this country was pricing himself out of the market."

Consider first the company owned and operated crew. Before the end of the war, it cost something in the vicinity of $30,000 to equip a one-drill seismograph party. Before the general advent of magnetic recording in 1955, the cost had increased to approximately $70,000. The cost is unknown today for parties equipped to play back tape in the field, to secure at least a monitor record or to bear the proportionate share of the equipment in a central play-back establishment. It undoubtedly exceeds $100,000.

Before the end of the war, this same crew with an average complement of twelve men had a labor bill of about $2,300 monthly, to which should be added something for vacations, sick leave, social security, and other benefits to the tune of about 12% or another $300 a month. The same people today cost in excess of $6,500, and the labor overhead as the result of longer vacations, added social-security benefits, insurance, retirement and thrift contributions has become about twice the former percentage.

The basic company operated seismic party has increased its labor bill from roughly $2,600 per month to $7,800. Operating expenses, explosives, office rent, repairs, permits, all skyrocketed. Permission to enter and explore, which was negligible before the war, climbed to sizeable sums, particularly in West Texas where per crew costs for this item alone frequently exceed $6,000 a month.

With all these increasing costs, what was the improvement in productivity? True, there was some. Many of you remember the basic requirement for employment during the war: warmth. At the end of the war, we had some bodies on field parties that were just barely warm. With one exception, however, productivity increase was very slight in terms of increased cost, even discounting the latter for inflation. The exception, of course, was the tremendous productivity of marine crews.

Please remember that we have been talking of basic 12-men crews. Outside of the swamps of Louisiana it was a rare crew in 1945 that exceeded 15 men. Today with multiple seismometers, multiple shot holes, deeper shot holes, the company labor bill has increased way beyond the figures so far quoted.

And while this was happening to the company-owned and staffed operation, what was happening to the contractors? Well, they were suffering too. Their travail, however, came principally from another direction. Not that their labor and equipment costs didn't go up. They did. The principal problem arose from the manufacturing for sale of seismic equipment and from credit availability.

Before and during the war there had developed about a dozen major seismic contractors. They designed and manufactured exclusively for their own use practically every item on the field party except the motor vehicles, the surveying equipment, and the hand-cranked calculator. At the end of the war, they were operating from ten to thirty units apiece.

Following the repressions of the war, there was a tremendous demand for an increased number of seismic parties which could not wholly be supplied from the facilities of the companies and existing contractors. En-

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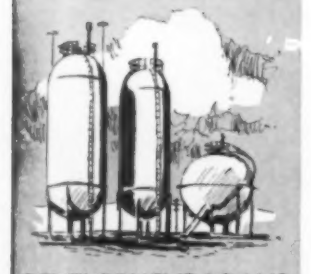

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trepreneurs built drills and water trucks for sale. Laboratory men left the major companies and the contractors and began the manufacture of technical seismic equipment for sale. Any supervisor or party chief with ambition and modest savings could finance the rental or purchase of equipment and start his own company. With a letter of agreement to employ, on delivery of specified equipment and men in the field ready to work, almost anyone could get adequate financing. And many did.

The Geophysical Directory for 1958 lists at least 108 seismic contractors in the United States. These varied in size from single-crew organizations to massive companies operating internationally with as many as 60 or more units in the field. The contractors with one, two, or three crews frequently depended on the affection and confidence of a single client.

When that client ran out of areas to work or cash, the small operator, faced with payments at the bank, a large payroll in terms of working capital, resorted to price cutting in an effort to find work. Many took contracts that had no real profit in them —the owner took the wages of a party chief for being that as well as sales representative, supervisor, and owner of the business. The result was slow death.

The major contractors with laboratories, vast equipment accounts, and long-term personnel obligations had to bid against the individual who could, if necessary, stop payment on his lease-purchase contracts and readily, though reluctantly, let his people go. The situation became so adverse that several of the larger contractors mutually employed an accounting firm to audit their books and present a study, available to each participant, showing the profit for a period of 10 years. The results were recently published in The Oil and Gas Journal. These showed that for six of the companies studied, income dropped from 5% of net revenue in 1947 to 1% of net revenue in 1956.

While the company operated crews were pricing themselves out of business by overpayments to labor, contractors were also pricing themselves out of business by underpricing their contract fees. Two of the dozen major seismic contractors that existed at the end of the war have given up the battle. The number remaining of the 108 listed at the start of 1958 is unknown. The mortality rate among contractors has been tremendous during the past 12 months. While not so severe, the mortality rate among company operated crews has been sizable.

The high mortality rate of company

operated field crew personnel will continue. Most companies have already discontinued the use and staffing of their own shot-hole drills. The remainder will have to follow suit. A company cannot afford to pay a premium for having its own people drill shot-holes.

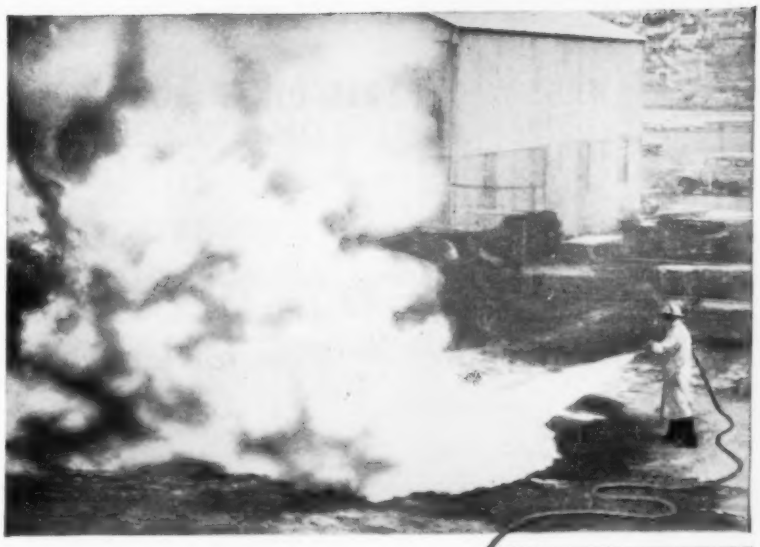
In the other phases of seismic operations, at least three major oil companies are seeking a solution by employing contractors to supply all the necessary field labor. This is an obvious step which others will follow. The oil company will supply its own manufactured recording equipment and the computing and interpretive staff. This, too, is part of the revolution in exploration through which we are now going.

Revolutions are destructive! But in their destructiveness they frequently beget ideas that produce improvement. It is safe to say that no group ever deliberately or inadvertently fomented revolution without rationalizing that betterment would follow the dislocations and destructiveness it created. We are in the midst of a profound revolution in petroleum exploration. What improvements can we develop from these dislocations and this destructiveness?

- First, we can reemphasive the value of and necessity for profit in the programs we recommend.
- Second, we can get rid of self-complacency in our thinking. We must produce new approaches to our problems. We must be willing to venture into the harsh and unknown, both mentally and physically.
- Third, we can get down to fighting weight. We must recognize that in many cases we have been overstaffed. It may be pleasant to have an extra man behind each geologist and geophysicist just to hand out sharpened pencils and erasers, but it is neither necessary nor profitable.
- Fourth, we can learn to communicate more fully and effectively with other workers in our general field. This is true between the laboratory and the field, between geologists and geophysicists, across corporate fences, international boundaries and languages.

As a step in this direction, it is suggested, here and now, that a necessity exists for an amalgamation of the various professional groups now separately representing geology and its specialists, the economic paleontologists and mineralogists, and geophysicists into an Institute of Exploration Geoscientists.

Such an IEG would appropriately have a section of petroleum geology, a section of petroleum geophysics, sections as necessary of mining geology



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and geophysics. It would be international rather than intranational in character and scope. Its birth will be attended by severe labor pains.

There will be many on both sides of the geological-geophysical fence who will decry the necessity for its birth and present many and cogent reasons for maintaining the status quo. There will be more on both sides who will recognize the overriding benefits to be derived and be willing to make the break with tradition. Two separated groups have not provided an adequate solution.

• Fifth, we have all sorts of new and exciting tools to aid in our exploration effort: thumpers, continuous-wave generators, cross-correlation techniques, variable-velocity interface simulators, acoustic logging tools, and many others for the geophysicist; a multiplicity of logging devices—latero, micro-latero, gamma ray, neutron, displacement, chemical, etc., for the exploration and exploitation geologist.

The effective use of all these tools is at less than maximum unless we exchange our knowledge and experience with each other. While we cannot properly divulge where we found the specific oil accumulation, there is no reason why we cannot, after appropriate interval, tell how we found it.

The successful search for oil in this country is becoming so exceedingly difficult that none of us can longer indulge in secrecy as to methods and techniques. Why, for example, should we consider acoustic logs as being less in the public domain than electric logs?

• Sixth, we can do none of these things without the maintenance of a healthy and profitable industry at home.

• Seventh, and finally, we can become increasingly world citizens in our exploration outlook and activity. Without sacrifice of national interest or sovereignty we can find that our own best interests are beneficially developed as we help and expand the best interest of others.

One-mile extension for Ohio's Sterling

A mile extension to production at Sterling in Milton Township, Wayne County, was announced by the operator, National Associated Petroleum Co.

The 1 H. L. Miller, Section 8, second Clinton at 3,272-80 ft. was fractured and gaged 600 M.c.f. gas with 20 bbl. oil in a 24-hour test.

Bell Lake outpost testing gas shows

A 1-MILE WEST OUTPOST to Devonian gas in Bell Lake field, Lea County, New Mexico, was slated for completion as a Morrow well.

Continental Oil Co. 5 Bell Lake unit reported top of the Devonian at 15,950 ft., a drilling break at 15,975 ft. and a gas kick at 15,960 ft.

A drill-stem test at 15,972-16,005 ft. recovered 30 ft. of slightly gas-cut mud, with very little flowing or shut-in pressures.

At 16,000-100 ft., flowing pressure ranged from 2,335-6,050 psi. and recovery was 1,911 ft. of gas-cut mud plus over 12,000 ft. of salt water.

Top of the Morrow was said to be low structurally to the company's 4 Bell Lake but if water can be blocked off, completion will be attempted in that section, according to reports. Location is SW NE 1-24s-33e.

Ellenburger oil for New Mexico?

AN ELLENBURGER gas-condensate well in Chaves County is believed to be New Mexico's first Ellenburger production, off the Central basin platform, 40 miles to the southeast.

The Texas Co. 1 Peery-Federal, in SW NE 29-15s-30e, 14 miles northwest of Maljamar, flowed gas at the daily rate of 1,666 M.c.f., plus 2 bbl. of condensate an hour from perforations in the Ellenburger at 12,068-105 ft. Additional pay was indicated at 12,070-170 ft.

No. 1 Peery-Federal is also a discovery in the Devonian, flowing oil on two drill-stem tests between 11,033-60 and 11,060-110 ft. Flows of oil ranged from 30-48 bbl. an hour. Operators will attempt dual completion.

Salt dome produces in North Louisiana

COMPLETION of a significant confirmation well in northern Louisiana's Minden salt dome area has been reported by Pan American Petroleum Corp. The Minden salt dome area is the first productive salt dome area in northern Louisiana.

Pan American 1 Youngblood, located in 21-19n-8w, Webster Parish, recovered gas at the rate of 45 million cubic feet a day and distillate at the rate of 11 bbl. per million feet on

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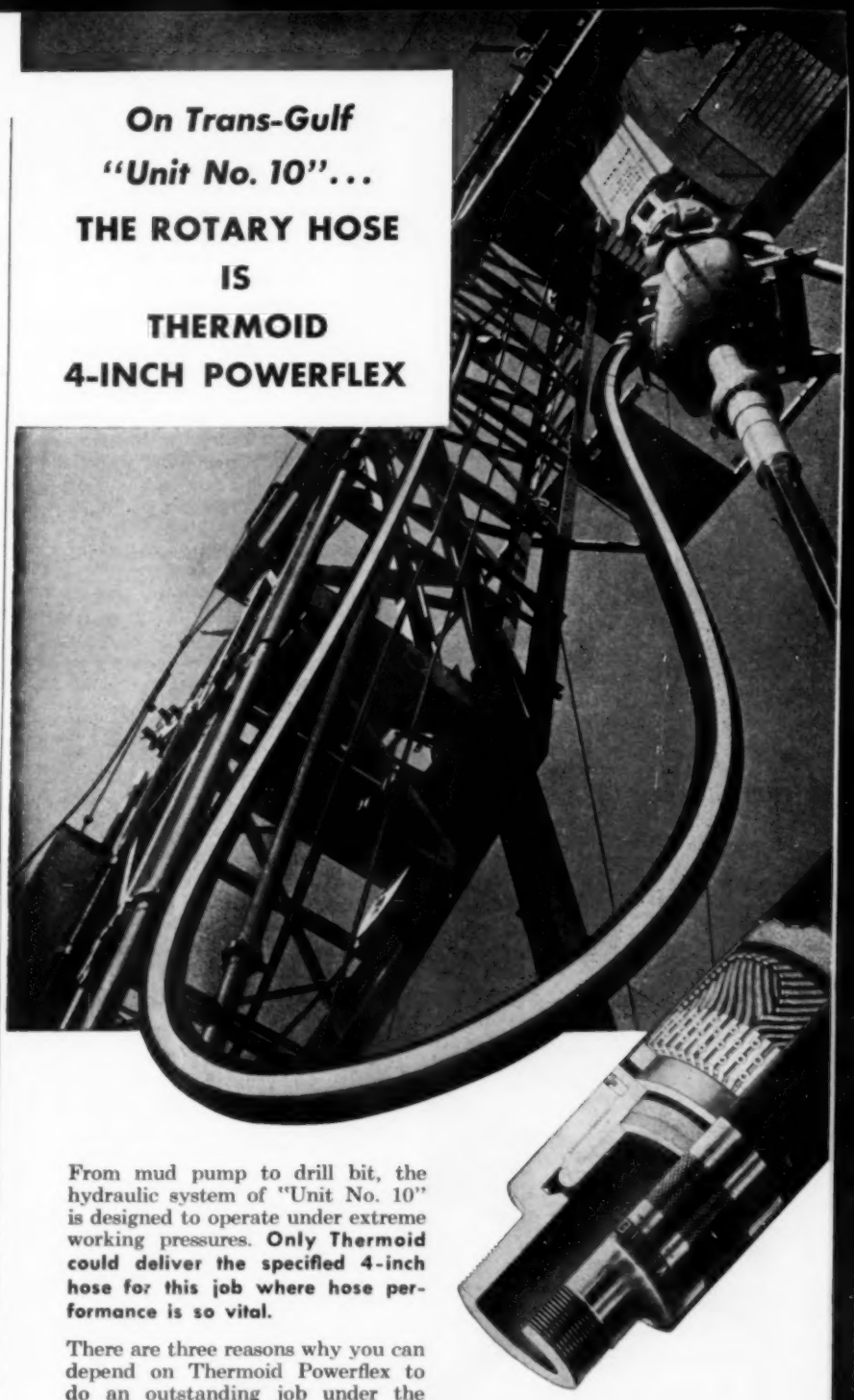

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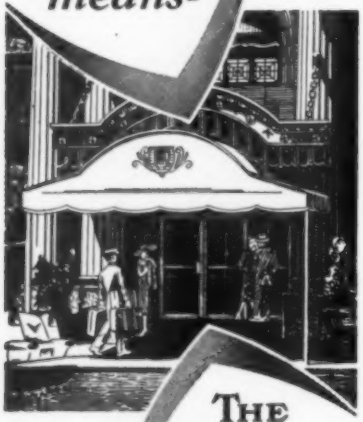

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a calculated open flow potential test.

Recovery was from the Paluxy sand, topped at 7,488 ft., through perforations 7,502-10 ft. The well was drilled to a total depth of 7,650 ft., plugged back to 7,570 ft. The 1 Youngblood is the third productive Minden salt dome area well, two of which are located on the east side of the salt dome.

The 1 Youngblood confirms production 160 acres to the southeast on the east side of the dome. The discovery well, Pan American 1 Anna Hudson, was completed in May 1957 for a calculated open flow potential of 9 million cubic feet of gas a day and 13 bbl. of distillate per million. Paluxy production in the discovery well is through perforations 7,460-66 ft. with top of pay at 6,550 ft.

Pan American has full interest in the 1 Youngblood and in 5,000 acres in the area. The well site is about 30 miles northeast of Shreveport.

Annual GSA meet set for St. Louis

THE DIVISION of engineering geology in the Geological Society of America will devote the morning of November 6 during the annual meeting in St. Louis to a symposium on "Rock Mechanics." The theme of the meeting is that the concept that solid rock is immobile is a fallacy well known to miners and others associated with excavations in the rocks of the earth's crust. The theme points up the importance of the physical characteristics of rock to civil-engineering projects.

The introductory paper on "The Effect of Elastic Properties of Rock on Civil Engineering Design" by William R. Judd of the Bureau of Reclamation, explains terminology and poses many questions that have resulted from apparent contradictions in the above divergent research.

Another peculiarity of rock is explored in a paper to be presented by the chief geologist of the Snowy Mountains Hydroelectric project in Australia. Mr. Moye describes the peculiar reactions occurring in the rock when the large underground chamber for one of their power plants was excavated.

Dr. A. D. Hogg of the Applied Mechanics Research Section of the Ontario Hydroelectric Power Commission in Toronto discusses rock movements during the construction of power features in the Niagara area of Canada.

The annual meeting of the society will be held in the Sheraton-Jefferson Hotel in St. Louis.

Kansas' Mohler field stretches

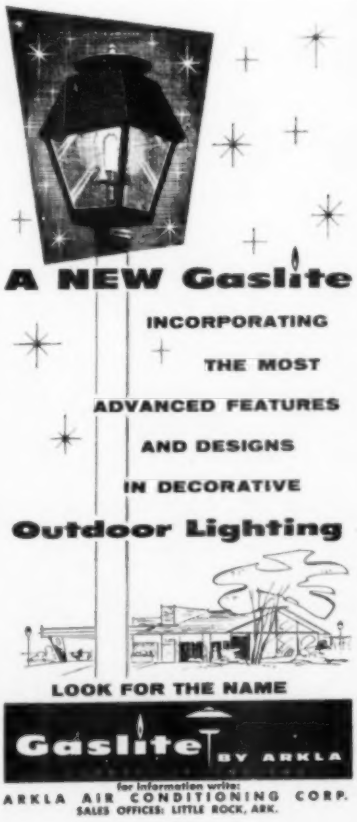
GOOD Morrow-Pennsylvanian gas production extended southwestern Kansas' Northeast Mohler pool 1 mile northeast. The extension discovery is Shamrock Oil & Gas Corp.'s 1 B. H. Cordes, SE SE SE 24-33-29, Meade County.

Gas flowed on calculated test at the rate of 43 M.M.c.f.d. from perforations at 5,586-5,609 ft.

Pennsylvania gas hit reported

GAS PRODUCTION was tapped by New York State Natural Gas Corp. in Armstrong Township, Indiana County, Pennsylvania. Original flow of gas was 669 cu. ft. per day, but after fracturing the flow was substantially increased to 5.7 M.M.c.f.

The well was drilled in Jacksonville pool to a depth of 7,748 ft. by Delta Drilling Co. for New York Natural. It will be tied into New York Natural's system in the near future.



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Dual discovery for Texas' Garza

POTENTIALS have been reported from both zones of a dual discovery in Garza County, West Texas. Geological location is along the northeastern rim of the Midland basin.

The well is Paul C. Teas 1 Skeeter-Slaughter, 8 miles southwest of Post, in Section 24, Block 1, Jasper Hays Survey.

Ellenburger potential through perforations at 8,491-96 ft. was 369 bbl. of 39.6°-gravity oil a day. Choke was 3/16-in., with tubing pressure of 525 psi. Gas-oil ratio was 151 : 1.

Pennsylvanian Strawn perforations at 8,168-78 and 8,192-96 ft. gaged 312 bbl. of 38.5°-gravity oil a day through 5/32-in. choke. Tubing pressure was 620 psi. Gas-oil ratio was not reported.

Garza County this year received more than its average share of exploration and development drilling. The southwestern portion has had several strikes, with most of the new pools producing from two separate zones. Teas 1 Slaughter is about 1 mile southeast of Strawn production, and 1 mile northwest of an 8,337-ft. dry hole.

Red Loftin gets second pay zone

RED LOFTIN (Ellenburger) field, opened by General American Oil Co. of Texas 1 Susie Koonsman along the southern border of Garza County, ran completion tests on its second pay zone.

Strawn reef potential was 390 bbl. of 40°-gravity oil a day, with no water, through 34-in. choke. Perforations were at 7,787-7,804 ft. Gas-oil ratio was 175 : 1.

Original completion was from the Ellenburger at 8,150-95 ft., flowing 333 bbl. of oil through 8/64-in. choke.

Location is in Section 5, Block 2, T&NO Survey.

West Texas scores Strawn gas find

EASTERN SCHLEICHER County gained another gas discovery, from an Ellenburger failure.

Sinclair Oil & Gas Co. 8-A Virgil J. Powell, nearly 1 mile northeast of Tillery multipay field (oil and gas), was dry in the Ellenburger at 4,672

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ft. but plugged back to 4,397 ft. and completed in the Pennsylvanian as a dual gas well.

Potential from a Strawn sand zone at 4,003-11 ft. was 2,200 M.c.f.d. of gas. The flow was calculated daily rate, open-flow. Pressures were not reported.

Strawn limestone perforations at 4,345-79 ft. flowed at the rate of 1,850 M.c.f.d. of gas, following 1,000-gal. acid treatment. Location is in Section 2, Block A, AB&M Survey.

Old wildcat flows on Matador arch

AN OLD WILDCAT, north of the Matador uplift, in western Motley County, West Texas, reported a small flow of gas and condensate.

Pan American Petroleum Corp. 1 O. E. Birnie, 9 miles northwest of Matador and due west of the town of Whiteflat, flowed 270 M.c.f. of gas and 8.3 bbl. of condensate on initial tests in the Pennsylvanian at 8,512-25 ft. Gas-liquid ratio was 33,800 : 1.

A 4-hour flow produced 5 bbl. of load oil and 6 bbl. of new oil.

Old total depth of the well was 10,010 ft.

Strike extends Hildebrandt Bayou

GAS PRODUCTION rated at 74 M.M.c.f.d. is being opened in a wildcat drilled by Central Southern Oil Corp. in the Hildebrandt Bayou area, 8 miles east of Fannett, in Jefferson County, Texas Gulf Coast.

The new gas well, 1 Broussard Trust et al., is just west of Hildebrandt Bayou oil production. It has a liquid yield (45°-gravity condensate) in the ratio of 26,040 cu. ft. of gas per barrel of liquid. Its Frio pay is perforated at 7,760-62 ft. Total depth is 8,565 ft.

Hildebrandt Bayou field was discovered in 1948. It has 5 wells from Frio sands at 7,700 to 8,100 ft.

New San Patricio field confirmed

DISCOVERERS of San Patricio field, just north of San Patricio townsite, in southwestern San Patricio County, South Texas, are confirming their strike in their second well, completed as another good oil producer from the same pay as in their initial well.

It so happens that the rated flow of the second well (No. 2 Glasscock) is the same as that of the discovery well, and from the same subsea depth. The wells are 933 ft. apart.

D. D. G. Gas & Oil Corp. and Armstrong & Horn completed their first well last August. Each is rated good for 160 bbl. of 41° to 42°-gravity oil per day through a P-34 choke. Each topped the Vicksburg pay at subsea depth of 5,997 ft., No. 1 at 6,105 ft. with surface elevation of 108 ft., and No. 2 at 6,107 ft. with elevation of 110 ft.

O'Brien Springs gets new try in Wyoming

A CONFIRMATION try to O'Brien Springs in Carbon County, Red Desert basin, Wyoming, has been made by Atlantic Refining Co. (see p. 141). The 1 O'Brien Springs Government, NE SW NW 35-25n-86w, will test the Tensleep at about 7,300 ft.

This new try for Tensleep-Pennsylvanian production in this area will be closely watched by Rocky Mountain operators because of the importance of the recently completed 3 O'Brien Springs Unit well which flowed 196 bbl. of oil in 4 hours on choke.

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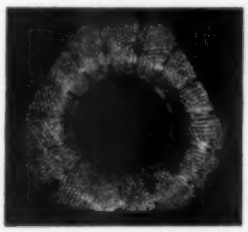

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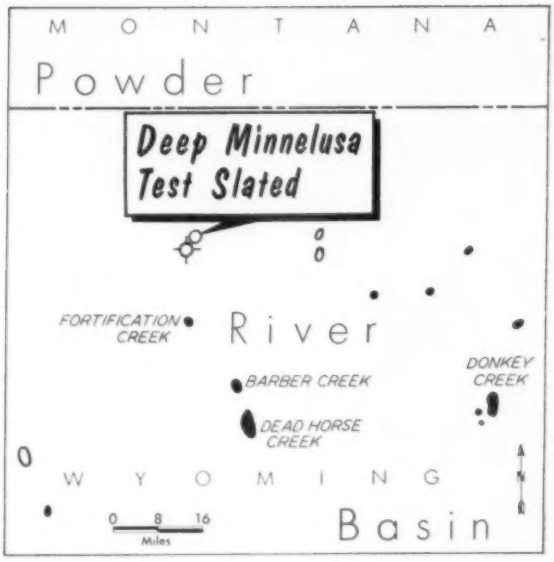

WATCH THIS deep Minnelusa wildcat! Its outcome could be of extreme importance to deep drilling in the northwestern reaches of the Powder River basin.

Deep Wyoming well tests Minnelusa

THE OIL-BARREN northwestern portion of Wyoming's huge Powder River basin will be an area to watch in the coming weeks.

Trigood Oil Co. plans to drill a 10,125-ft. Minnelusa-Pennsylvanian wildcat at 2 Ingram in C NW SE 3-54n-77w, in Sheridan County's Arvada area.

This newest addition to Wyoming's growing deep-drilling campaign will test the Minnelusa at about 9,925 ft. Only drilling depths will be released as the well goes down.

Location is about 1 mile northeast of the 1 Ingram-A which went to 10,531 ft. before stopping. No data were released on this well. There was an oil recovery in the Minnelusa, but was not considered commercial. Nearest production is about 16 miles south at Fortification Creek field.

Second test set for Sweetwater

PLANS ARE DUE for Pubco Petroleum Corp.'s second test, Pubco 8-1 Playa Federal, in the NE¼ 8-20n-98w, in Sweetwater County, Wyoming.

This is the second well on the company's Red Desert prospect on which it controls approximately 10,575 acres. The proposed well will be drilled through the Almond member of the Mesaverde formation which will be penetrated at about 5,800 ft. The new well, Pubco 8-1 Playa Federal, will be located 1½ miles southeast of the company's first well on the prospect.

The company's first test, Pubco 34-1 Playa Federal, is located in the extreme northeast corner of the company's acreage and is currently shut-in awaiting final potential tests. Pre-

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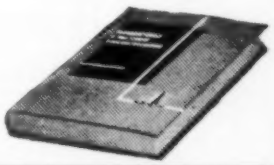

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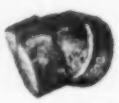

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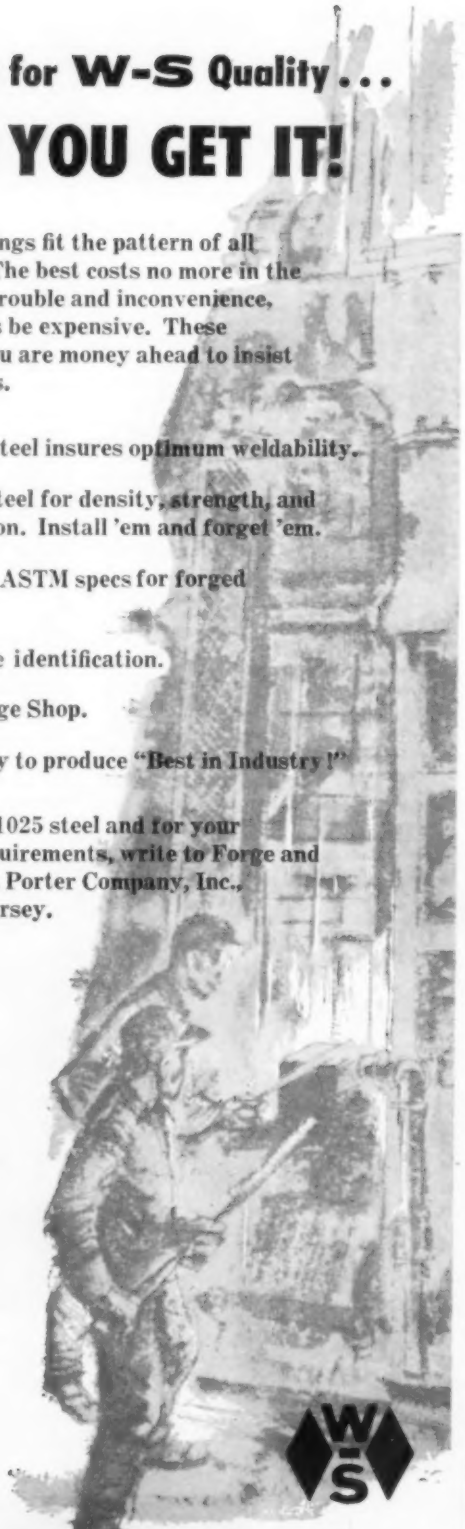

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liminary gages indicate a good commercial gas well.

It is anticipated that gas and associated distillate will be obtained in the Lewis formation and gas production from the Almond member of the Mesaverde formation. Final potential tests on the first well are planned on or before October 13, 1958.

Coyote Creek gets Dakota production

DAKOTA PRODUCTION was opened in the Coyote Creek area of Crook County in northeastern Wyoming's Powder River basin. The discovery well is True Oil Co. 1 Krause, N½ NW SE 33-49n-68w.

True's well, the first important strike in this area in several months, flowed 450 bbl. per day from perforations in the Dakota-Cretaceous at 6,474-78 ft. The second well is already under way at a northeast offset, the 2 Krause, C SE NW 33-49n-68w. Location of this new field-opener is 2½ miles southeast of South Donkey Creek field, one of the most important areas in the basin's new oil-hunting era.

Extensions highlight Illinois oil play

NO NEW POOLS were discovered in Illinois in September according to the Illinois Geological Survey, Division of the Department of Registration and Education.

However, the September tally lists the discovery of nine extensions to pools, as follows: one each to Woburn Consolidated in Bond County, Mt. Auburn Consolidated in Christian County, Ashmore South in Coles County, Omaha in Gallatin County, Parkersburg Consolidated in Richland County, Dale Consolidated and Harco in Saline County, and Clay City Consolidated and Locust Grove South in Wayne County.

A total of 246 wells were completed in September, a 4-week period, for an average of 61 per week. The completions include 105 oil wells and 1 gas well or 43% successful.

Wayne County, with 22 wells completed, had the most completions during September. Gallatin, Hamilton, and White counties followed in that order with 19, 18, and 17 completions, respectively.

Estimated production for Illinois for September is 6,840,000 bbl. of oil.

California hit boosts Buena Vista field

A BIG PRODUCER was reported at Richfield's northerly extension test to Tidewater Oil Co.'s 555 Stevens pool in the Buena Vista Hills of Kern County. The Richfield well, 554-ROCO-United A, flowed at a rate of 2,004 bbl. daily of 30.4°-gravity crude through a 1½-in. choke from perforations at 5,134-5,408 ft.

Richfield choked it back to a 13/64-in. and it was making 311 bbl. daily with 112 M.c.f.

The week prior, Standard Oil Co. of California joined this five-well field with a southwesterly extension ½ mile from the discovery well. The Standard well flowed at a 984-bbl. daily rate through a 24/64-in. choke.

California highlights . . . Drilling for new gas reserves in northern California counties continues with a late count showing six wildcats active in the play. Honors are about evenly divided with one wildcat in Colusa, Glenn, Solano, and Sonoma counties and two in Tehama County. Two dry holes hit Mountain View field operators recently. Termo Co. quit a 13,000-ft. dry hole about 3 miles southwest of Mountain View production while Union Oil Co. turned up a dry hole with an 8,322-ft. test in the Houchin pool area.

Offshore trio tests California waters

THREE OFFSHORE tests are under way in California's state-owned tidelands. All three are unique in their own way. A rundown looks like this:

. . . Richfield Oil Corp. was drilling below 1,247 ft. on its first test being sunk from an earth-filled artificial island located on a 1,170-acre lease 1 mile offshore from Rincon in Ventura County.

. . . Standard Oil Co. of California was drilling below 5,600 ft. on 1 Gaviota State, the first test on a 3,840-acre lease of Gaviota in Santa Barbara County. Standard is using the coast's only mobile drilling platform to drill this test. Results of this first hole will be used to locate a site for a platform for a permanent development of the lease.

. . . Standard of California was also drilling below 3,000 ft. on the initial

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wildcat on the 5,500-acre lease it and Humble Oil & Refining Co. also hold at Summerland in Santa Barbara County. This well is being sunk from the state's only permanent drilling platform which is designed to accommodate 25 completed oil wells.

Strike proves up California field

ADDITIONAL ACREAGE was proved up by The Texas Co. on the south flank of Bridge pool South Mountain field, with one of the largest wells in the area to date.

Located in SE SE 15-3n-21w, the Texaco well, 3 Texas-Union-Norcop, was dually completed making 1,527 bbl. daily of crude. The upper zone at 7,770-8,050 ft. was making 605 bbl. daily of 42.1°-gravity oil through 20/64-in. choke. The lower zone at 8,200-8,402 ft. and 8,575-9,161 ft. was flowing 922 bbl. daily of 36.8°-gravity crude through a similar size choke.

Since its discovery in December 1955, development of this field has been mostly in a southwest direction along the overturned Oakridge fault until now just a little more than 1 mile separates it from the prolific Saticoy field to the south. This and the Saticoy field are producing from Pliocene formations under the Oakridge fault.

Utah's Uinta gets gas, oil production

MESAVERDE gas and oil production was opened in the Uinta basin at El Paso Natural Gas Co. 4 Southman Canyon in SW NE NE 29-10s-24e, Uintah County, Utah.

The well finaled flowing 4,700 M.c.f.d. of gas plus 121 bbl. of high-gravity oil per day. Production is from the Mesaverde Cretaceous at 5,942-66 ft. Location is 4 miles southeast of Southman Canyon gas field.

Remote Paradox wildcat shows oil

THE WESTERN FLANK of Utah's Paradox basin highlights exploratory interest in the Rockies. Tennessee Gas Transmission Co. reports oil shows at a remote wildcat in Garfield County.

The 1-A U.S.A.-Poison Springs, SW SW NE 4-31s-12e, is preparing to core at 4,676 ft. after finding shows in samples from 4,310 to 4,676 ft. in the Pennsylvanian. A drill-stem test in the Hermosa at 4,164-94 ft. got 160 ft. of 37.5°-gravity free oil and 10 ft. of gas-cut mud.

This highly significant prospect is a 6,100-ft. Devonian wildcat on the west side of the basin. Nearest oil production is 50 miles northeast at Big Flat; closest gas production is 40 miles northwest at South Last Chance.

Molas test due in Utah's Paradox

THE BOTTOM of the Pennsylvanian will be looked at by Continental Oil Co. at its 7 Navajo-C extension to White Mesa field in Utah's Paradox basin.

The well, originally slated as a 6,250-ft. Paradox-Pennsylvanian test, will go down to the Molas at about 7,350 ft. Drilling is now at 6,834 ft.

This San Juan County well flowed 40 bbl. of oil hourly on ¾-in. choke on drill-stem test at 5,905-6,071 ft. Location is on the south side of White Mesa field. The nearest deep well to the 7 Navajo-C is a Carter Oil Co. well, 1 Unit, 2 miles east. That one went to 7,321 ft. in the Devonian.

A REMOTE Frontier-Cretaceous wildcat is slated for a far-removed area of the Green River basin in Lincoln County, Wyoming.

Driller will tap Opal Unit

THE GREEN RIVER BASIN, current leader in Wyoming exploration, has a deep test in the mill at Belfer Natural Gas Co. 2 Opal Unit, SE 20-22n-112w, Lincoln County. This deep one will forge down to 11,000 ft. for a look at the Frontier sands.

Location is 2 miles northwest of Carter Oil Co.'s 1 Unit, a Morrison failure at 12,366 ft. Carter found gas on drill-stem tests of the Frontier near 11,067-11,133 ft. and 11,067-11,190 ft.

The Opal Unit block includes 40,802 acres. It is about 13 miles northeast of Kemmerer, Wyo., midway between LaBarge field (26 miles to the north) and Church Buttes field.

Deep test for Kentucky's Carter

A DEEP (Cambro-Ordovician) test for Carter County has gotten under way as Carter Development Co. 1 Burton drills below 550 ft.

Located about 2½ miles north of Olive Hill, the county seat, the test is likewise 9 miles west of the recently completed 1 Simmons, a dry hole which penetrated 80 ft. of Knox dolomite (Cambro-Ordovician) to a total depth of 3,642 ft. before abandoning.

Kentucky well hits oil

In the Pike County sector of Big Sandy gas field, Columbian Fuel Corp. has completed a good well at its A-2 Emperor Coal Co.

Located on Peter Creek (Matewan Quadrangle—6-SW) test topped productive Mississippian Big Lime at 2,100 ft. with pay from 2,247 to 2,249 ft., 2,341 to 2,348 ft. and 2,348 to 2,362 ft. Well was completed natural for 8,861 M.c.f.d. of gas with a 4-day rock pressure buildup of 227 psi.

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Seeco-Mul emulsion muds minimize hole enlargement, reduce water invasion of pay sands, allow better completions in zones with low pressures and low permeabilities, and allow wells to come in on production better, easier, and cleaner. The same logs as run in fresh water muds are entirely suitable in emulsion muds. Seeco-Mul muds often allow better logs to be obtained because the emulsion does not block the formation as in the case of water systems. Seeco-Mul increases the wetting action of the mud on the drill bit and the collars, which results in less drag, less torque, less balling of the bit on bottom, and fewer round trips.

Seeco-Mul has a number of other operating advantages which your local mud dealer will be glad to tell you about — or write to us. We'll be glad to send you illustrated literature and a lab sample without obligation. Crossett Chemical Company Division of The Crossett Company, P. O. Box 271, Crossett, Arkansas.

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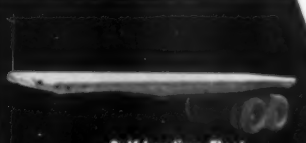

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Another Cockfield pool opens in Allen

DISCOVERY of another new field, productive of gas and condensate, is reported in Allen Parish, southwestern Louisiana.

Its discovery well, drilled by Lamar Hunt, is 8 miles southwest of Oberlin, and about 2 miles northeast of Harmony Church field, nearest production.

Production is from Cockfield sand at 9,828-46 ft. The well, 1 Rice, flowed at the rate of 171 bbl. of 53.8°-gravity condensate per day with 1,233 M.c.f. of gas. Pressure was 3,125 psi.

Harmony Church field, discovered by The Texas Co. in 1955, has been productive from Marginulina and Frio sands at 5,890 and 7,700 ft. Two oil and three gas-condensate wells have been completed. Only one remains on production.

Condensate strike at Smith Point

NEW GAS-CONDENSATE production is being opened by Gulf Oil Corp. in the Smith Point area on the east shore of Galveston Bay, in Chambers County, Texas Gulf Coast.

Its discovery well, 1 Frankland, 1½ miles northeast of East Smith Point field, is rated good for 5,580 M.c.f.d. of gas with a liquid recovery of 1 bbl. to 126,270 cu. ft. Liquid is 53.6°-gravity condensate. Flowing pressure through ⅝-in. choke was 3,270 psi. Shut-in pressure is 4,580 psi.

Production is from Frio sand at 9,684-90 ft. in hole drilled to 11,489 ft.

Michigan wildcat outpost abandoned

NEW STARTS made bigger news in Michigan than drilling wells as a highly promising outpost and rank wildcat were abandoned after testing oil pays.

McClure Oil Co. will drill 1 Pease, SE NW SE 8-1s-14w, to the 3,400-ft. Trenton zone, first deep test for the 1938 developed Bloomingdale, Van Buren County, 1,200-ft. Traverse oil field. Bloomingdale was a sensational play just 20 years ago including a town-lot spree that helped dramatize the need of an oil-control law, that followed a year later.

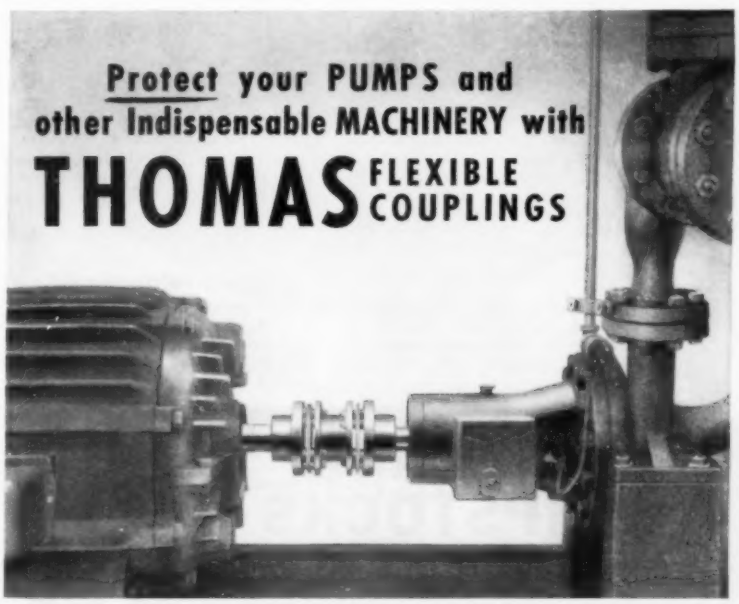
Tom Mask and McClure Oil Co. will drill a 4,600-ft. Trenton test on the 1 Rosenau, NW NW SW 23-3s-4w, Calhoun County, about 1 mile south of a Continental Oil Co. wildcat that penetrated the Trenton 15 years ago.

Robert Bond 1 Schwass, SW NW NE 11-17n-17w, 1 mile northwest outpost to Riverton pool, Mason County, was abandoned after a 1,000-gal. acid treatment had negative results to a Traverse lime pay at 1,643 ft. Test carried 250 ft. of oil natural before the treatment.

Don F. Rayburn 1 Little, NE NE 12-8n-4e, Shiawassee County, swabbed 6 to 8 bbl. oil per day from Berea pay at 1,628 to 1,670 ft. after 500-gal. acid treatment but recovered 90% water after sand fracture. It was Rayburn's fifth wildcat in the area this year.

Dual completion for Oklahoma's Harper

NORTHWESTERN Oklahoma's gas play continues to expand. Dual completion is reported at a discovery well 3 miles north of Northwest Laverne and 3½ miles southwest of North Rosston pool in Harper County, just



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outside the entrance to the Oklahoma Panhandle.

The 1 Barby Unit, a Pan American Petroleum Corp. wildcat in NE NW SE 23-27n-26w, flowed 1,714 M.c.f.d. of gas on ½-in. choke from the Chester-Mississippian; from the Morrow at 6,674 to 6,698 ft. it made 5,400 M.c.f.d. on ½-in. choke.

Successful wildcats

EASTERN NEW MEXICO

Lea County: Atlantic Refining Co. 1 Lowe Land Co., 24-13s-37e, 12 mi. SE Tatum, 4 mi. W Bronco field. IP 325 BOPD, ¼-in. 40° gravity, GOR 1,600, TP 825 psi., Wolfcamp 9,828-62 ft. TD 12,902 ft., elev. 3,880 ft.

TEXAS GULF COAST

Bee County: Lone Star Producing Co. 1 May, Oscar Farish Sur., A-161 (3 miles west of Normanna). IPP 16.15 BOPD, 41°, perfs. 3,507-13 ft. (Hockley). TD 9,400 ft. (New pay and extension in South Tuleta area.)

Chambers County: M. P. S. Drilling Co. 1 Griswold et al., George L. Short Sur., A-288 (8 miles southeast of Baytown). Absolute open-flow potential 16,500 M.c.f. daily, perfs. 4,988-94 ft. TD 7,000 ft. (New-field discovery 1½ miles southwest of South Cotton Lake field and 1¼ miles northeast of Jergins field.)

DeWitt County: Claud B. Hamill 1 Adolph Haun, James S. Turner Sur., A-460 (3 miles southeast of Meyersville). Absolute open-flow potential 2,310 M.c.f. daily, GLR 43.02 M.c.f. per bbl., 58.2°, shut-in TP 2,698 psi., perforations 8,138-48 ft. (first Massive Wilcox). TD 8,500 ft. (New-field discovery.)

Jackson County: Midhurst Oil Corp. and Ogden & White 2 Lindburg-Rose Unit 1, H. W. Munson Sur., A-57 (8 miles east of Edna). Absolute open-flow potential 7,000 M.c.f. daily, GLR 104 M.c.f. per barrel, 53°, shut-in TP 2,587 psi., perfs. 6,808-13 ft. (Frio-Rose sand). TD 7,605 ft. (New pay in Hornbuckle field.)

Newton County: Timberland Exploration Co. 1 Morgan et al., C. Champion Sur., A-77 (4 miles southwest of Deweyville). IP 53.7 BOPD, ⅛-in., 44.3°, GOR 4,610 cu. ft. per barrel, TP 1,050 psi., perfs. 7,243-48 ft. (First Hackberry). TD 7,786 ft. (Extension and new reservoir in West Hartburg field.)

Tyler County: Timberland Exploration Co. 1 Campbell, William S. Brown Sur., A-62 (3½ miles northeast of Warren). IP 57.17 BOPD, 3/16-in., 41.3°, GOR 5,720 cu. ft. per bbl., TP 550 psi., perforations 8,200½-06½ ft. and 8,188-98 ft. (Wilcox). TD 8,717 ft. (New field—Turkey Creek.)

Wharton County: Anderson & Cooke 1 Cihal, J. V. Nueva Sur., A-314 (6 miles west of El Campo). Absolute open-flow potential 3,250 M.c.f. daily, dry gas, shut-in TP 1,065 psi., perforations 2,968-75 ft. (Miocene). TD 3,026 ft. (New field—Brownson Home.)

TEXAS PANHANDLE

Lipscomb County: El Paso Natural Gas Co. 1-B Kelln, 1 mile southeast offset to 1 Kelln, Sec. 111, Blk. 43, H&TC Sur., 9 miles northwest of Canadian in southwestern part of the county. IP 600 BOPD, 45°, various chokes, Penn 7,298-7,314 ft. TD 7,480 ft.

Ochiltree County: Petroleum Exploration, Inc. et al., 1-82 Rendleman, Sec. 82, Blk. 13, T&NO Sur., 15 miles south Perryton, 8 miles southeast Farnsworth field. IPP 44 BOPD, 39° gravity, GOR 899:1, top pay 8,598 ft., perforated Morrow sand 8,611-21 ft. TD 9,504 ft., elev. 2,984 ft.

SOUTHWEST TEXAS

Hidalgo County: V. F. Neuhaus 1 C. M. Bulman Unit, Lot 183, Sec. 161, West Tract Subd., Llano Grande Grant (2 miles northwest of Weslaco). Absolute open-flow potential 2,130 M.c.f. daily, GLR 1,273 M.c.f. per barrel, 50°, shut-in TP 4,834 psi., perf. 9,468-88½ ft. (Frio). TD 9,863 ft. (New pay in North Weslaco field.)

McMullen County: Standard Oil Co. of Texas 1 Calliham, Michel Hely Sur., A-6 (in Calliham townsite). IP 22.1 BOPD 9 net), 93% water, ¼-in., 31°, TP 750 psi., perf. 4,730-36 ft. (upper Wilcox). TD 12,637 ft. (New field.)

Arnold Well Service 1 Rhodes, Sec. 56, Alfred Spaulding Sur., A-94 (24 miles northeast of Freer). Absolute open-flow potential 11,500 M.c.f. daily, dry gas, perf. 2,645-50 ft. (Jackson). TD 2,659 ft. (New pay in Jake Hamon field.)

Starr County: S. H. Howell 2 Mrs. F. V. W. Heard heirs, Sec. 20, Share 2, G. O. Newman Subd., El Benadito Grant, A-338 (10 miles south of Delmita). Absolute open-flow potential 21,200 M.c.f. daily, GLR 71.1 M.c.f. per barrel, 64.6°, shut-in TP 2,147 psi., perf. 5,525-39 ft. and 5,543-46 ft. (Frio). TD 6,641 ft. (New-field discovery.)

WEST TEXAS

Andrews County: E. P. Campbell 1 Mahew et al., 20-A51-PSL, 27 mi. W Andrews. Recompletion as oil discovery. Old TD 12,380 ft., PB 9,700 ft., IPP 80 BOPD, 43° gravity, GOR 1,550, Devonian 9,645-80 ft.

Concho County: Tucker Drilling Co. 1-C Henderson, 24-8-H&TC, 15 mi. SW Eden, ½ mi. NW oil production in Ha-Jo field. IP 1,200 M.c.f. gas, plus 15 BOPD, 24/64-in., 39° gravity, TP 400 psi., Strawn 4,260-66 ft., TD 4,430 ft., ground elev. 2,282 ft.

Kent County: General Crude Oil Co. 1 Wallace (was Ray Smith 1 Wallace), 34-5-H&GN, 3 mi. NW Polar. IP 190 BOPD, 16/64-in., 41° gravity, GOR 562, TP 200 psi., Ellenburger open hole 7,732-7,846 ft., TD. Elev. 2,297 ft.

King County: Grigg Oil Corp. 1-B Parramore, 94-F-H&TC, 12 mi. SE Guthrie. IP 420 BOPD, 24/64-in., 38° gravity, GOR 175, TP 65 psi., Upper Tannehill pay 3,137-44 ft., TD 3,210 ft.

Pan American Petroleum Corp. 13 Masterson, Sec. 152, Blk. A, W. J. Montgomery Sur., 16 mi. NE Guthrie. IP, calculated open flow, 7,000 M.c.f. gas, Pennsylvanian 5,275-5,350 ft., TD 6,260 ft., ground elev. 1,680 ft.

Runnels County: Murray Petroleum 1 Mrs. Glenn Eager, W. H. Goe Sur. 1, ⅝ mi. SE production in Braley field. Recompletion. Dry at old TD 4,678 ft., IP 157 BOPD, 16/64-in., 41° gravity, GOR 350, TP 225 psi., Gardner sand 4,388-91 ft. PB 4,444 ft.

WEST CENTRAL TEXAS

Taylor County: Eastland Oil Co. 1 G. H. Blackburn, Sec. 3, LAL Sur., 8 mi. SE Abilene, IP 159 BOPD, 18/64-in., 47° gravity, GOR 350, TP 350 psi., pay 1,750 ft. TD 1,767 ft., elev. 1,797 ft.

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This L. D. Riggs #A-2 well was drilled to 12,300 feet with a large steam drilling rig. 1500 feet of 7-inch 29# P-110 Extreme Line casing were used. Shell also used 2987 feet of 13⅜-inch and 7089 feet of 9⅝-inch N-80 J&L casing in this well.

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Kemball-Cook Faces Tough Job

. . . as new "vice president in charge of vice presidents" for Shell. Varied experience qualifies him for his post.

IF IT weren't for the hyphenated surname, you'd never guess that Denis B. Kemball-Cook, Shell Oil Co.'s newest executive vice president, was born in Britain.

This could be due to any one or a combination of several influences. He worked his way to the top in the best American tradition. He acquired his American citizenship in Houston and has spent most of his working life in "two of the fastest growing cities in the world," Houston and Caracas. He has been concerned with exploration, production, refining, economics, and supply.

These varied influences have left him an amiable, soft-spoken, almost leisurely executive. They are qualities which could be assets in a tough job. Kemball-Cook's province now is exploration and production.

He has been referred to jokingly as the "vice president in charge of vice presidents." Eight report to him: Both the vice president in charge of exploration and the vice president in charge of production in New York and six area vice presidents in New Orleans, Houston, Tulsa, Denver and Los Angeles. Shell of Canada depends on his office for advice on exploration and production matters.

Strong position . . . The heavy emphasis on exploration and production has paid off for Shell.

Last year it produced 63% of its refinery requirements. Few major companies, especially when overseas production is excepted, enjoy so strong a crude-oil position. With imports curtailed, that position becomes even more enviable.

Kemball-Cook attributes much of Shell's success to his predecessor, Alan J. Galloway and the organization he built.

During Galloway's 10-year tenure, Shell increased its production about 50% and, according to H. S. M. Burns, president, "led the industry in the discovery of new reserves in the United States." When he comments on Galloway's achievements, Kemball-Cook recognizes that the brightly furnished office he inherited on the forty-second floor of the RCA building is something other than a bed of roses.

He believes that the "wonderful organization" he inherited from Galloway will continue its record. And

Denis B. Kemball-Cook
. . . Briton turned Texan.

Kemball-Cook should be able to make his contributions to it. His career indicates that he is qualified to do so.

On the way up . . . His success story covers a route from grease monkey in a service station to the executive vice president's office.

His first winter with the company in a Manchester, N. H., service station, in 1932 "must have been the coldest in the history of New England," he recalls.

From the service station Kemball-Cook went to a Shell training course in Boston. After a year there and a short time in Shell's main offices, at that time in St. Louis, he was transferred to Houston.

He later spent some time as roustabout and roughneck on Shell drilling rigs from West Texas to southern Louisiana. He returned to Houston in 1935, remaining there, except for a few months, until 1945.

Overseas experience . . . That was the year when things began to open up in Venezuela.

He was sent there as assistant to the manager for exploration and production for Caribbean Petroleum Co. In the early '50's Caribbean Petroleum and Venezuelan Oil Concessions merged into what is now Cia. Shell de Venezuela. By 1951 he had risen to director, responsible for economics, refining, and supply.

At the time he went to South America, Shell's Venezuela production averaged about 200,000 bbl. per day and its refining capacity was about 40,000 bbl. In 1957 Shell's Venezuelan production averaged 873,922 bbl. per day and its refining capacity, including the 220,000-bbl. per day Cardon refinery, reached 265,000 bbl. per day. This year the latter has gone as high as 325,000 bbl. per day.

Kemball-Cook came back to the United States in 1957 as a director and vice president of Shell Caribbean Petroleum Co. He was named one of Shell's two executive vice presidents on June 30, 1958.

Background . . . He was educated first at the Shrewsbury School, Shropshire, in the west of England. At Oxford he majored in economics and studied philosophy and history.

He and his family live in Darien, Conn., about a mile from Long Island Sound. There Kemball-Cook hopes to do some sailing, a sport he first enjoyed on Lake Maracaibo. But, he says with a note of regret, its the farthest he has been from a refinery or producing field in many years.

The Kemball-Cooks have two sons, one a chemical engineering graduate of Princeton and now a reserve second lieutenant, and the other a student in Morristown, N. J. A daughter, 11, attends school in Darien.

●

Robert L. Sullivan, assistant division gas superintendent in Sun Oil Co.'s southwest production division, has moved up to superintendent. He succeeds **G. B. Bennett,** who recently joined Houston Corp. as vice president in charge of sales and operations for distribution properties. **John E. Walke,** division gas engineer, and **Aubrey V. Hamilton, Jr.,** special assistant, have been appointed assistant division gas superintendents for Sun. Walke will be in charge of plants and operations; Hamilton will handle contracts and sales.

Dr. Carl H. Samans, associate director of engineering research for Standard Oil Co. (Ind.), will receive one of three annual merit awards from the Chicago Technical Societies Council November 12. The awards recognize outstanding contributions to science.

Neil E. Hanson, formerly geologist with Christi, Mitchell & Mitchell, has joined MPS Production Co., Houston, as chief geologist.

▶ ▶ ▶ Personals

BEAL

Rex H. Beal, division drilling coordinator for Warren-Bradshaw Exploration Co., has been promoted to drilling coordinator and will head the company's drilling department. He will headquarter in Tulsa. **J. L. Gilbert,** Four Corners district drilling superintendent, has been transferred from Farmington, N. M., to Oklahoma City as division drilling superintendent there. He will be succeeded in Farmington

GILBERT

CLAIBORNE

by **R. B. Claiborne,** West Texas-New Mexico district drilling superintendent in Midland, Tex. Beal and Claiborne joined Warren-Bradshaw in 1948. Gilbert has been with the company since in 1943.

R. R. Alworth, district superintendent for Humble Oil & Refining Co., has been transferred to Hobbs, N. M., from Brookhaven, Miss.

L. C. Secrest, assistant manager of Continental Pipe Line Co.'s Oklahoma-Kansas-Illinois district, has been named North Texas district superintendent. He moves to Wichita Falls, Tex., from Ponca City, Okla. **R. W. Lee** moves up to succeed Secrest in Ponca City.

Chester L. May, senior vice president of Lone Star Gas Co. has retired. May was general manager of several Lone Star subsidiaries before being elected vice president in charge of distribution properties in 1942. He became a director in 1949 and senior vice president in 1954.

Burton McCollum, head of McCollum Exploration Co., Houston, was presented a lifetime membership in the Society of Exploration Geophysicists at the SEG annual meeting in San Antonio last week. McCollum, who holds 13 patents in the field of geophysical exploration, became interested in the use of sound waves for subsurface exploration as early as 1916. Working with Atlantic Refining Co. in Mexico, he did the seismic work on a well which is believed to be the first ever drilled on a seismograph location. McCollum also was one of the first to use multiple geophones.

Ray S. Watson, production engineer with Phillips Petroleum Co., has been transferred to Eureka, Kans., from Morgan City, La.

H. V. Blanke, district production superintendent for Aylward Drilling Co., has moved to Wichita from Great Bend, Kans.

A. D. Parsons, Skellytown, Tex., district foreman for Northern Natural Gas Co., has moved to Spearman, Tex., as district foreman.

Hoyt Austin is the new western district manager for Mene Grande Oil Co. in Venezuela, with offices in Lagunillas. He succeeds **George Lockett,** who transferred to Puerto La Cruz to take charge of a new marketing department. In other western division changes, **Bernardo Diaz** was placed in charge of drilling, production, and geology, and **H. R. Riedell** heads industrial relations, accounting, materials, and transportation.

William D. Price has been transferred by Humble Oil & Refining Co. from Midland, Tex., to Houston as senior engineer.

B. G. Nippert, production foreman with Arkansas Fuel Oil Corp., has been transferred to Ingleside, Tex., from Alice, Tex.

Fred M. Thompson, Jr., former geologist with Sinclair Oil & Gas Co., has joined Houston Natural Gas Production Co. as Corpus Christi, Tex., district geologist.

William D. Blankenship, former geologist with Shell Oil Co. in Denver has joined the Philippine operations of William Ross Cabeen & Associates as geologist in the Manila office. **C. K. (Kim) Ham,** Los Angeles district geologist for Cabeen, has been transferred to Lima, Peru.

Richard H. Butler, petroleum engineer with Union Oil Co., has been transferred to Coalinga, Calif., from Santa Paula, Calif.

Laurie M. Sloan, Humble Oil & Refining Co. supervising petroleum engineer in New Orleans, has been named district supervising petroleum engineer in Paradis, La.

C. E. Wharton, vice president in charge of manufacturing for Warren Petroleum Corp. before his retirement in July, will open offices as consulting engineer in Tulsa. He will specialize in management and personnel problems as well as in construction and operating problems having to do with the natural-gasoline industry. Wharton was with Standard Oil Co. (Ind.) and later was a free-lance superintendent of construction on natural-gasoline plant projects before joining Hanlon-Buchanan, Inc., in 1932. He was general superintendent of plants for Hanlon when the company was purchased by Warren Petroleum.

Gordon D. Kerns, senior technologist at Vickers Petroleum Co.'s Potwin, Kans., refinery, has been named technical director in charge of the new refinery technical-service department. Also assigned to the department are **Raymond S. Gibson,** senior process engineer; **William L. Caldwell,** development technologist; and **Donald R. Bolt,** technical assistant.

Robert R. Price has been named geologist and production engineer with Stekoll Oil & Gas Co. in Estevan, Sask.

Leonard W. Robbie, former vice president, general manager, and a director of Republic Oil Refining Co., has joined Texas City Refining, Inc., as vice president in charge of plant operations. Robbie is also a former vice president of Plymouth Pipe Line Co. and former president of Duval Gasoline Co.

V. H. Jones, Humble Oil & Refining Co.'s district superintendent in Pickton, Tex., has been transferred to Gladewater, Tex., in the same capacity.

Ralph L. Robie, tool pusher with Carpenter-Trant Drilling Co., has been transferred to Rocky Springs, Wyo., from Rangely, Colo.

F. R. Wade, Union Oil Co.'s division petroleum engineer in Santa Paula, Calif., has been promoted to chief valuation engineer and transferred to Los Angeles.

Lewis C. Jarrell, former Ardmore, Okla., consulting geologist, has been named manager of the new Lafayette, La., office of Perkins Oil Co. of Wichita Falls, Tex.

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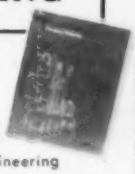

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▶ ▶ ▶ Personals

Hal S. Dean has been named head of geological operations at El Paso Natural Gas Co.'s new San Antonio, Tex., land and geological office. Dean was with Edwin W. Pauley, independent operator, in the San Antonio area before recently joining El Paso Natural.

A. J. Longley, division drilling engineer for Shell Oil Co., has been transferred to New Orleans from Lake Charles, La.

William T. Ford, New Mexico district geologist for Richardson & Bass, has been transferred to Midland, Tex., from Carlsbad, N. M. The company has closed its Carlsbad office and now has only one geological and land office for Texas and New Mexico.

C. J. Gudim, Sinclair Oil & Gas Co.'s Casper, Wyo., district geologist, has been promoted to staff geologist and transferred to Denver. **Donald W. Wiger,** senior geologist at Casper, has been promoted to district geologist there.

Ernest Musslewhite, Jr., has been promoted to head of the mechanical section, process research division, for Esso Research & Engineering Co. He succeeds **Ray Van Sweringen,** who becomes head of a new operations section in the chemical research division.

COATES

Jack G. Coates, manager of crude-oil purchasing for Gulf Oil Corp.'s southern division in Houston, has been named manager of domestic crude-oil supply. The new post will cover the entire U. S. There was previously a northern division operating out of Gulf's Pittsburgh headquarters. In Pittsburgh, **W. H. Blackledge** takes over as manager of the crude-oil department, Western Hemisphere. These duties were previously handled by **R. P. Huggins,** vice president, who is retiring.

Richard L. Parker, partner, head exploration geologist and secretary-treasurer for Petroleum Explorations, Inc., Amarillo, Tex., has resigned to open consulting offices in Amarillo.

Ben C. Belt, who retired in 1955 as vice president and managing executive for Gulf Oil Corp.'s Houston production division, has been elected a director of Delhi-Taylor Oil Corp. He succeeds **G. L. Rowsey,** who has resigned because of poor health. Rowsey was one of the founders of Taylor Refining Co. He served as president and board chairman of Taylor and has been a director since the Delhi-Taylor merger in 1955. Responsibilities of **P. T. Bee,** who recently resigned as executive vice president of Delhi-Taylor to join Murchison Brothers, will be divided among Delhi-Taylor executives. **James L. Sewell,** president, will take over part of Bee's general management functions. **C. H. Hobbs** has been named executive assistant to the president. He will continue as corporate secretary. **G. B. Lintner** has been named controller in addition to his duties as treasurer. **W. C. Smith,** vice president of production, will coordinate activities of the geological, land, and geophysical departments of the exploration division. Also, **Fred P. Sewell,** vice president for manufacturing and marketing, will move his office to Dallas from Corpus Christi, Tex.

Dale R. Snow, chairman of the board of Petro-Atlas, Inc., has been elected a director of Atlas Corp., the parent company.

Carl A. Setterstrom, special projects manager for Charles Pfizer & Co., Inc., has joined Sun Oil Co.'s research and development division as assistant director, commercial development.

▶ ▶ ▶ Deaths

Ben H. van der Linden, 78, head of world-wide production activities for the Royal Dutch-Shell group until his retirement in 1940, died October 5 while on a visit to Holland. Van der Linden was named first exploration and production chief of the Shell companies in the U. S. in 1913. As head of Shell's California exploration, he was credited with the company's discovery of the Ventura field in 1922 and with establishing the first major-company production engineering department. He returned to Holland in 1922 and, after a short period in Indonesia, was named world-wide head of production for the Royal Dutch-Shell group. He had lived in New York since retirement.

James Oscar McPherson, 74, retired assistant superintendent of Sun Oil Co.'s Houston division, died October 12 in Beaumont, Tex. McPherson retired in 1954 after 46 years with Sun.

Jack S. Hunter, 36, president of Hunter-Drilling Co., Calgary; **F. M. Valint,** superintendent for the company; and **F. O. Hanson,** pilot and transport department officer, were killed on October 9 in a company plane crash 150 miles east of Calgary. The three were returning from a drilling site near Estevan, Sask.

Harry E. Lillibridge, 62, head of Lillibridge Co., Enid., Okla., geological consulting firm, died October 14 in an Enid hospital. Lillibridge was with the old Indian Territory Illuminating Oil Co. and later with Eason Oil Co. before establishing his own firm in 1941.

N. B. Llewellyn, 58, San Joaquin, Calif., manager of purchases and stores for Standard Oil Co. of California, died October 8 in Taft, Calif., after a heart attack.

J. W. Cason, Sr., 62, vice president, treasurer, and a director of Interstate Oil Pipeline Co., died October 12 in Shreveport, La.

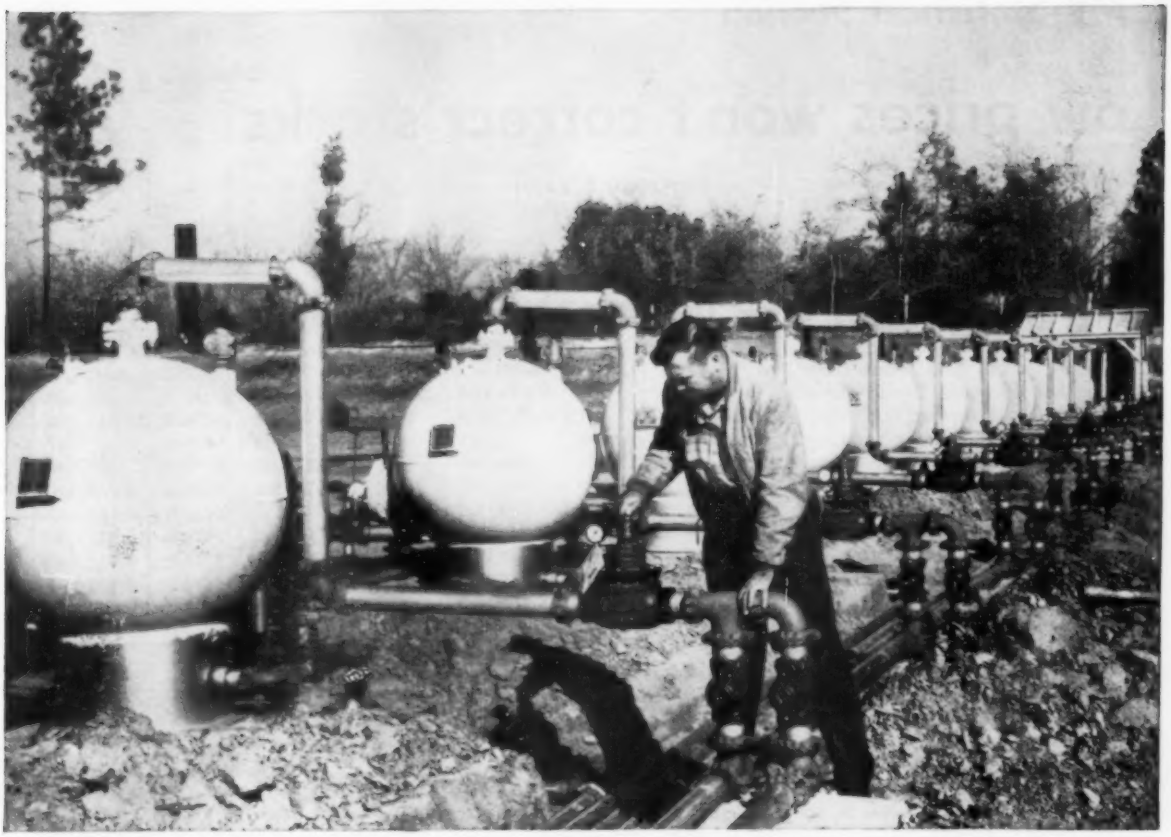
John W. House, former head of Humble Oil & Refining Co.'s western division and long-time Midland, Tex., oil man, died October 10 in Midland.

George Holland, 43, senior drilling engineer for Atlantic Refining Co. in Midland, Tex., died October 10 in Dallas after a heart attack. Holland and his family had gone to Dallas to attend the Oklahoma University-Texas University football game.

Eugene Frank Blaise, 70, president of the Cushing Gasoline Co. until his retirement in 1954, died October 11 in Tulsa. Blaise was vice president of the old Inland Refining Co., early-day Oklahoma firm.

J. Norvelle Walker, 60, president of Royal Oil & Gas Corp., Merion, Pa., died October 9 after a heart attack. Walker was vice president, treasurer, manager, and a director of Royal Oil before being elected president in 1955.

Roy M. Hunter, 71, Tulsa consulting petroleum engineer and independent operator, died October 10 at his home after a short illness. Hunter was with Ohio Oil Co., Gulf Pipe Line Co., and Stanolind Oil & Gas Co. (now Pan American Petroleum Corp.) before becoming a consultant in 1931.



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Low prices won't correct stocks

BY JOHN C. CASPER
Economics Editor

OCTOBER is the critical month of the year for product storage. Stocks of middle distillate have gained each October since the end of World War II. Gasoline stocks have shown more increases than decreases. Even residual stocks tend to inch upward in October unless industrial demand is booming. Minor product stocks tend to follow the same trend.

Refiners and producers often build crude stocks in the fall for a backlog to meet high winter refinery runs. All of these factors point to one conclusion: if storage space becomes scarce at any time during the year, that time probably will be in October.

The abnormal national stock gain is the end result of many refiners' problems. For a given refiner, stocks may be classed as excessive since the total is more than he planned for the opening of the winter season.

A refiner who runs a check on his gasoline stocks in October and decides he has more gasoline than he needs can do one of two things.

1. If his distillate stocks are a little low, he can shift refinery yields from gasoline to middle distillates. If he has plenty of distillate in his tanks, he can cut runs and then shift to higher distillate yields.

2. The alternate solution is to push part of the gasoline on the open market. If he starts early enough and cuts low enough, he can find a customer. He may solve his storage problem by creating one for some other refiner.

Each refiner will try to find the cheapest way out of the maze, but the total industry problem can be solved only by a better balance between supply and demand.

For the country as a whole, clean-product stocks are not too high. Gasoline inventories amounted to about 173,000,000 bbl. at the end of September compared with 180,000,000 bbl. last year and 178,000,000 bbl. in 1956. Middle-distillate stocks are running about 23,000,000 bbl. below the high level reported for last year and are up only about 2,000,000 bbl. from 1957.

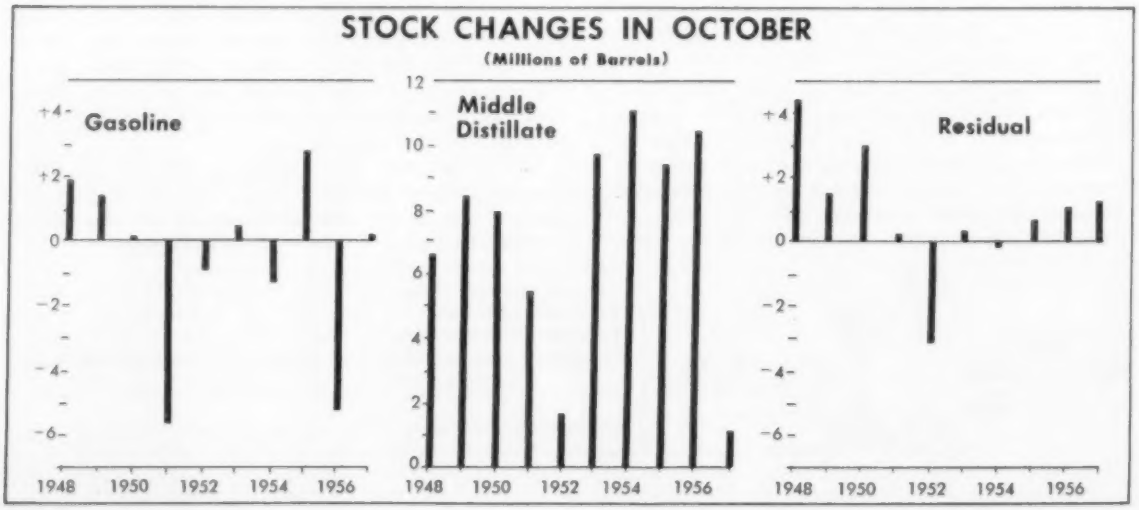
However, the gains and losses are not evenly distributed by districts. Gasoline stocks in District 2 are about 4,500,000 bbl. higher than last year and 2,000,000 bbl. above the 1956 level. Middle-distillate stocks also show gains in District 2 in contrast to reductions in Districts 1 and 3.

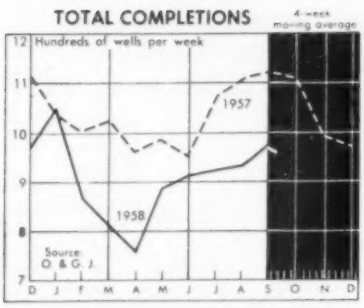
High gasoline stocks in District 2 are creating some pressure on gasoline prices. Spot sales of unbranded gasoline are based on formal quotations of 12 cents. Open discounts of 0.25 to 0.375 cent are freely available, and a large unbranded jobber probably could do a little better.

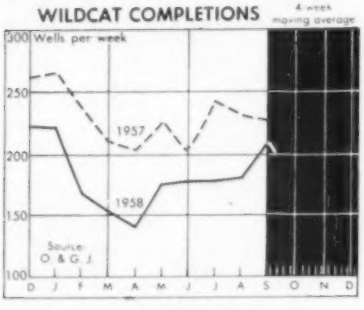
Oversupply in District 2 will have to be corrected by a better supply-demand balance. Lower prices won't increase demand but they will add to the refiner's deficit.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,885,800	DOWN	136,350	UP	58,400
Crude stocks	250,327,000	UP	2,282,000	DOWN	33,011,000
Completions	931	UP	32	DOWN	247
Refinery runs	7,723,000	UP	216,000	DOWN	21,000
Gasoline stocks	172,914,000	UP	432,000	DOWN	5,034,000
Kerosine stocks	31,364,000	UP	47,000	DOWN	4,482,000
Distillate stocks	158,742,000	UP	2,214,000	DOWN	13,941,000
Residual stocks	68,996,000	UP	254,000	UP	9,955,000
Four-product stocks	432,016,000	UP	2,947,000	DOWN	13,502,000
Total imports	1,509,200	DOWN	211,500	UP	43,400







Active Rotary Rigs*

	10-13-58	10-6-58	10-14-57
Alabama	9	7	4
Arkansas	22	22	27
Arizona	2	1	1
California	71	71	90
Colorado	42	38	60
Florida	1	1	1
Georgia	....	....	....
Idaho	....	....	....
Illinois	59	55	63
Indiana	13	10	11
Iowa	3	3	2
Kansas	144	150	162
Kentucky	11	6	10
Louisiana	300	300	432
North	37	21	57
South	228	237	283
Offshore	35	42	92
Maryland	....	....	1
Michigan	9	8	11
Missouri	1	1	....
Montana	23	23	40
Mississippi	51	49	41
Nebraska	21	24	28
Nevada	....	....	....
New Mexico	92	89	139
New York	2	2	....
North Dakota	30	30	38
Ohio	3	....	....
Oklahoma	213	207	251
Oregon	....	....	1
Pennsylvania	9	9	13
South Dakota	1	3	1
Texas	737	686	876
South-Gulf	153	137	178
Offshore	....	1	4
North-East	170	162	(†)
W. Central	252	226	(†)
West	162	160	(†)
Tennessee	....	....	1
Utah	36	37	66
Washington	1	1	1
W. Virginia	4	4	3
Wyoming	62	61	78
Virginia	....	....	....
Total U. S.	1,972	1,898	2,452
Weste'n Canada	154	145	165
Eastern Canada	3	3	3
Grand total	2,129	2,046	2,620

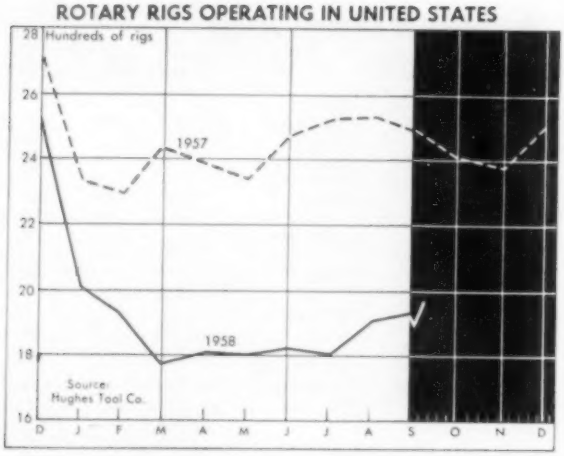
*Hughes Tool Co. †Comparisons not available due to change in method of reporting.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED OCTOBER 11, 1958

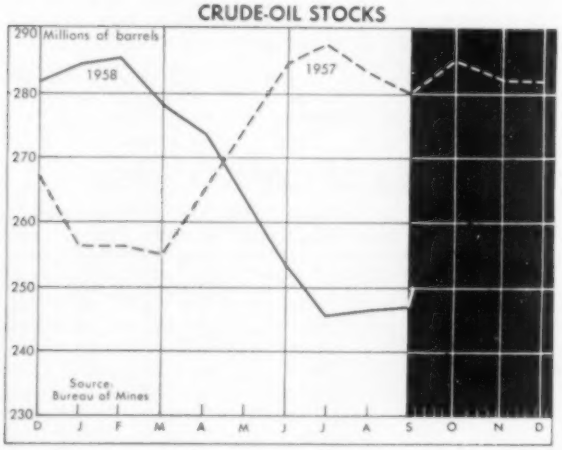
	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1958	1957	Total	Crude	Cond.	Gas	Dry	1958	1957
Alabama	2	0	0	0	2	0	23,170	61	67	0	0	0	0	0	23	21
Arkansas	23	12	0	1	10	0	83,180	601	864	5	0	0	0	5	127	163
California	30	18	0	0	12	0	172,290	1,205	1,714	8	0	0	0	8	289	414
Colorado	16	0	0	0	16	0	75,017	638	659	14	0	0	0	14	373	437
Illinois	37	23	0	1	13	0	82,007	1,743	2,065	6	1	0	0	5	352	496
Indiana	14	1	0	0	13	0	22,036	614	511	7	0	0	0	7	225	103
Kansas	88	51	0	4	31	2	309,277	2,971	3,291	21	4	0	0	17	626	661
Kentucky	32	14	0	0	18	0	48,174	912	1,167	8	0	0	0	8	122	235
Louisiana	69	30	5	8	26	0	499,559	2,675	2,988	8	1	0	0	7	392	531
North	33	13	0	8	12	0	133,625	1,009	1,088	3	1	0	0	2	167	145
South	30	13	4	0	13	0	304,336	1,325	1,367	5	0	0	0	5	202	320
Offshore	6	4	1	0	1	0	61,598	341	533	0	0	0	0	0	23	66
Michigan	14	3	0	0	9	2	35,428	337	333	7	0	0	0	7	110	120
Mississippi	10	7	1	0	2	0	95,725	301	303	2	0	0	0	2	138	158
Montana	6	4	0	0	2	0	35,911	259	328	3	1	0	0	2	104	127
Nebraska	19	4	0	0	15	0	116,179	555	688	8	0	0	0	8	259	381
New Mexico	37	12	2	11	12	0	164,733	1,509	1,689	4	0	0	0	4	208	223
West	20	4	2	11	3	0	102,218	734	704	1	0	0	0	1	87	86
East	17	8	0	0	9	0	62,515	775	985	3	0	0	0	3	121	137
New York	11	5	0	0	0	6	14,856	429	363	0	0	0	0	0	39	7
North Dakota	12	7	0	0	5	0	86,138	354	223	3	0	0	0	3	114	101
Ohio	21	10	0	8	2	1	53,193	795	879	0	0	0	0	0	12	10
Oklahoma	115	64	1	4	37	9	360,108	4,967	5,032	16	3	0	2	11	682	584
Pennsylvania	0	0	0	0	0	0	0	438	517	0	0	0	0	0	14	39
Texas	335	197	8	15	109	6	1,275,578	13,949	17,150	61	8	1	0	52	2,858	4,098
Dist. 1	34	12	0	0	22	0	77,100	777	985	12	1	0	0	11	308	336
Dist. 2	14	7	1	2	4	0	85,428	586	598	2	1	0	0	1	157	210
Dist. 3	20	10	3	0	6	1	112,981	988	1,345	2	0	0	0	2	219	380
Dist. 4	13	4	1	2	6	0	69,081	909	1,116	5	0	1	0	4	272	363
East	21	11	1	0	9	0	95,564	964	1,058	7	0	0	0	7	268	305
Dist. 7-B	41	27	0	0	14	0	90,413	1,897	2,332	8	2	0	0	6	530	794
West	90	70	1	0	16	3	439,792	4,004	4,847	12	4	0	0	8	565	691
Dist. 9	74	42	0	1	29	2	205,263	2,814	3,736	11	0	0	0	11	450	932
Dist. 10	28	14	1	10	3	0	99,956	1,010	1,133	2	0	0	0	2	89	87
Utah	5	1	0	0	4	0	26,554	294	174	4	0	0	0	4	68	87
West Virginia	10	2	0	7	1	0	25,519	574	531	0	0	0	0	0	14	25
Wyoming	21	7	0	1	13	0	65,084	593	665	8	1	0	0	7	180	230
Misc. (Tenn., Ariz.)	4	0	0	0	4	0	5,835	74	112	4	0	0	0	4	64	95
Total U. S.	**931**	472	17	60	356	26	3,675,551	36,848	42,313	**197**	19	1	2	175	7,393	9,346
Prev. week	899	399	15	65	387	33	3,570,509	.....	.....	183	21	3	0	159	.....	.....
Cum. 1958	36,848	17,990	884	2,792	14,203	979	152,026,891	.....	.....	7,393	724	125	203	6,341	.....	.....
Western Canada	47	33	0	2	12	0	245,312	1,910	2,419	8	1	0	1	6	513	683

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*
(Thousands of barrels)

	10-4-58	9-27-58	10-5-57
Pennsylvania	2,899	2,828	3,074
Other Appalachian	1,432	1,406	1,813
Illinois, Indiana, Michigan	9,919	10,119	11,169
Nebraska and North Dakota	2,376	2,283	3,308
Kansas	9,478	9,350	10,501
Oklahoma	16,632	16,190	21,246
Arkansas	1,897	1,752	2,493
Louisiana	16,238	16,302	19,567
North	3,028	2,821	3,321
South	13,210	13,481	16,246
Mississippi, Alabama, Florida	2,513	2,677	2,579
New Mexico	7,464	7,924	10,274
Texas	107,047	105,627	127,075
East Texas	8,171	7,837	10,400
West Texas	52,153	52,476	58,962
Texas Gulf	19,578	19,322	25,585
Other Texas	27,145	25,992	32,128
Wyoming	13,274	13,562	15,641
Other Rocky Mountain	9,353	9,113	6,098
California	34,387	33,947	31,919
Foreign	†15,418	14,965	16,581
Total	**250,327**	248,045	283,338

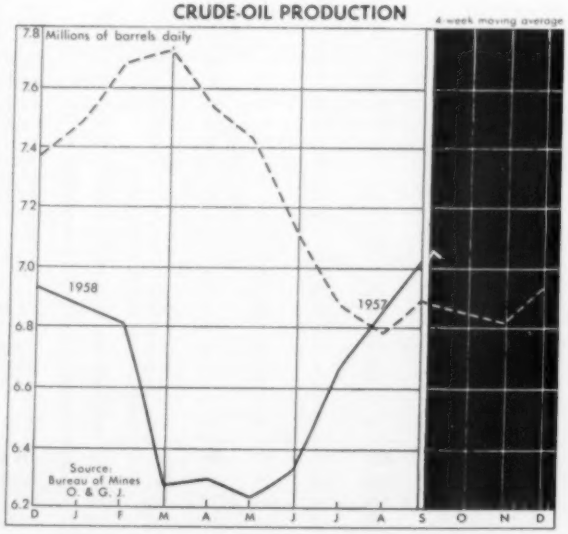
*Bureau of Mines. †Includes 5,630,000 bbl. in California.

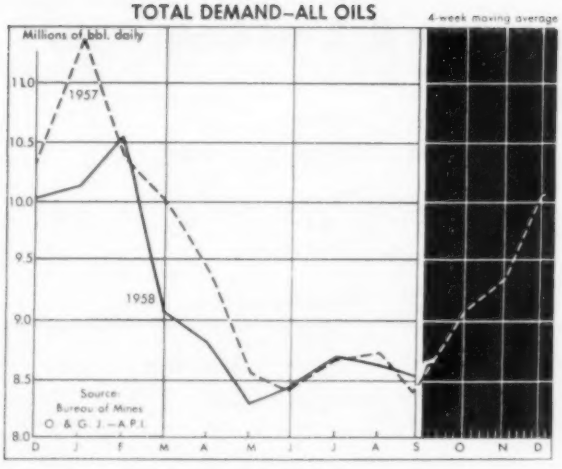
DAILY AVERAGE PRODUCTION FOR WEEK

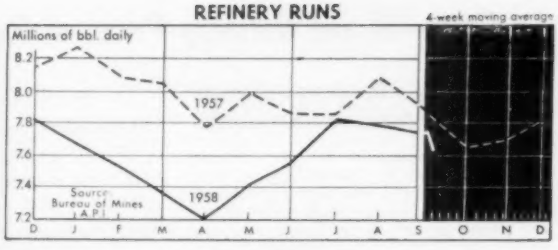
	October 11, 1958			Oct. 4
	Crude oil	Lease condensate	Total	total
Alabama	16,275		16,275	16,225
Arkansas	74,600	150	74,750	74,725
California	853,500		853,500	854,500
Colorado	130,500		130,500	130,900
Eastern	47,300		47,300	46,800
Florida	1,200		1,200	1,225
Illinois	226,900		226,900	230,900
Indiana	33,100		33,100	32,600
Kansas	†326,500		†326,500	†339,000
Kentucky	43,700		43,700	41,400
Louisiana	807,400	89,600	897,000	891,275
North	107,400	3,200	110,600	110,600
South	700,000	86,400	786,400	780,675
Michigan	24,500		24,500	24,200
Mississippi	105,100	4,400	109,500	108,225
Montana	77,800		77,800	77,000
Nebraska	58,000		58,000	57,700
Nevada	100		100	100
New Mexico	277,100	6,000	283,100	281,325
North Dakota	11,000		11,000	18,500
Oklahoma	†555,100		†555,100	†561,300
Texas	2,620,000	63,200	2,683,200	2,801,475
Dist. 1	47,000	500	47,500	48,075
Dist. 2	116,000	8,300	124,300	131,150
Dist. 3	342,000	31,000	373,000	391,275
Dist. 4	194,000	7,800	201,800	212,650
Dist. 5	31,000	400	31,400	33,125
Dist. 6	120,000	6,800	126,800	132,525
East Texas field	149,000		149,000	158,700
Dist. 7-B	144,000	50	144,050	150,325
Dist. 7-C	138,000	4,050	142,050	146,050
Dist. 8	1,022,000	2,000	1,024,000	1,077,150
Dist. 9	210,000	1,500	211,500	212,650
Dist. 10	107,000	800	107,800	107,800
Utah	105,400		105,400	106,700
Wyoming	327,200		327,200	325,900
Others	‡175		‡175	‡175
Total U. S.	6,722,450	163,350	**6,885,800**	7,022,150
Change from previous week, down			**136,350**	
Canada	†427,400		†427,400	†403,500
Total U. S. production—January 1-October 11			§1,874,004,400 bbl.	
Same period last year (crude plus cond)			*2,060,905,602 bbl.	

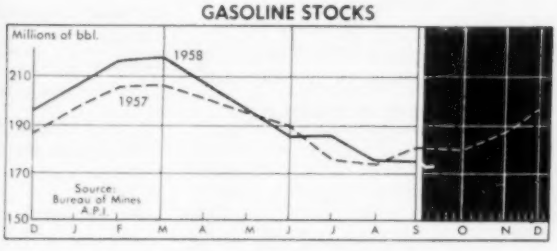
*Includes 39,646,165 bbl. condensate. †Week ended previous Monday. ‡South Dakota and Washington. §Revised.

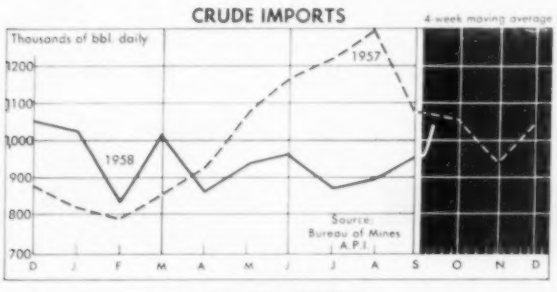
CRUDE-OIL PRODUCTION

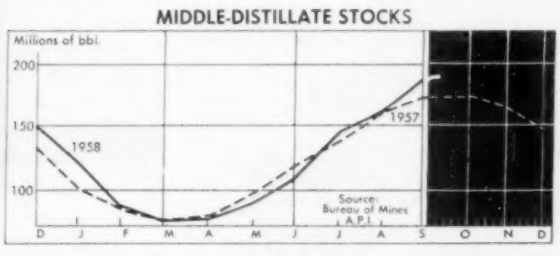


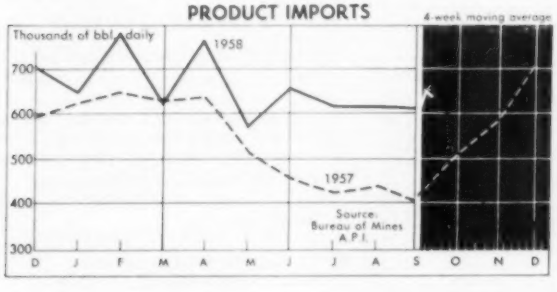


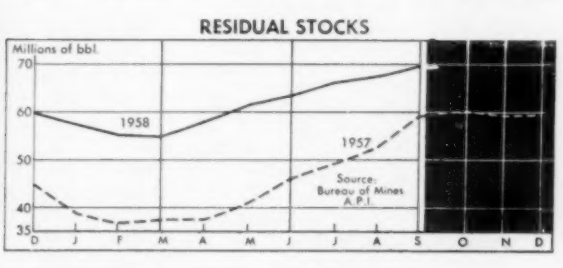












API REFINERY REPORT, OCTOBER 10, 1958

(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, October 1957: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast	1,079	521.3	44.7	272.7	175.7	41,442	11,569	56,916	13,147	1,088	487.2	24.5	306.7	166.6
Appalachian:														
District 1	97	43.4	4.3	22.4	8.3	4,633	605	3,771	333	108	46.8	4.6	23.9	8.7
District 2	99	51.2	7.7	22.3	13.7	2,301	536	1,499	192	109	54.8	5.6	17.9	11.5
Ind., Ill., Ky.	1,331	709.0	59.3	282.9	119.1	32,033	7,821	28,522	5,691	1,367	730.5	69.0	275.0	161.3
Minn., Wis., Dak.	38	15.1	1.1	10.3	4.9	6,678	1,402	8,582	519	82	38.9	1.6	22.6	7.2
Okla., Kan., Mo.	735	413.0	11.4	180.7	30.9	16,525	1,856	13,221	1,208	709	396.9	11.8	167.8	30.7
Inland Texas	264	182.0	4.6	59.3	21.7	6,520	359	2,060	2,075	256	206.3	7.6	48.5	26.4
Tex. Gulf Coast	1,835	962.3	135.7	438.2	185.4	22,161	3,262	17,285	8,928	1,792	924.3	97.7	432.3	208.6
La. Gulf Coast	702	396.6	38.4	174.6	38.0	9,894	2,084	7,347	1,504	614	355.5	31.9	164.4	42.2
N. La. and Ark.	97	43.6	5.9	23.1	7.4	4,027	1,154	2,178	117	85	35.5	5.7	18.8	5.6
Rocky Mtn.:														
New Mexico	19	12.1	0.3	3.1	0.9	396	16	138	52	28	15.4	0.5	5.5	3.5
Other	269	125.7	3.0	62.0	29.9	4,123	341	2,983	839	261	128.2	3.5	61.8	34.2
West Coast	1,158	472.7	6.7	204.4	308.8	22,181	359	14,240	34,391	1,151	474.8	1.5	160.1	345.2
Oct. 10, 1958	7,723	3,948.0	323.1	1,756.0	944.7	172,914	31,364	158,742	68,996	7,650	3,895.1	265.5	1,705.3	1,051.7
Oct. 3, 1958	7,507	3,794.7	247.1	1,753.7	958.4	172,582	31,317	156,528	68,742	.....	.....	.....	.....	.....
Oct. 11, 1957	7,744	3,909.0	265.1	1,771.6	1,044.7	177,948	35,846	172,683	59,041	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):

Regular (89 octane)	11.75-12.25
Premium (99 octant)	14.75-15.25

Gulf Coast (cargoes for coastwise or export movements):

Regular (90 octane)	10.25
Regular (92 octane)	10.50
Premium (97 octane)	11.625
Premium (98 octane)	11.75

California (rack) (Los Angeles):

★ Regular (88 octane)	12.2-13.7
★ Premium (94 octane)	13.2-15.5
★ Premium (98 octane)	14.2-16.5

Caribbean area (cargoes):

Regular (87 octane)	9.875
Premium (97 octane)	11.625

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:

Grade 26-70	4.5

Breckenridge:

Grade 26-70	4.0

*If 26-70 natural is considered as 100%, prices for lower-vapor-pressure grades increase 2.5% for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):

Kerosine 42-44	9.75-10.00
Diesel oil (58 d.i. and above)	9.50-9.75
Distillate No. 1	9.50-9.75
Distillate No. 2	8.75-9.00

Gulf Coast (cargoes):

★ Kerosine 41-43	9.00-9.125
Distillate No. 2	8.625

New York Harbor (barges):

Kerosine 41-43	9.95
Distillate No. 2	9.45
Diesel fuel, 48-52 d.i.	10.05

Caribbean area (cargoes):

Distillate No. 2	8.625

WAX (LB.)

Oklahoma (Group 3):

132-135 A.m.p. (semi-refined) in tank car	6.50

New York (export):

126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):

Residual fuel (max. 1% S)	$1.40-1.50

Gulf Coast (cargoes):

Bunker C fuel	$2.00

New York Harbor (barges):

Bunker C fuel	$2.37

Caribbean (cargoes):

Bunker C	$2.00

California (rack):

Bunker C fuel, Los Angeles	$2.10

LUBRICATING OILS

Mid-Continent (Group 3):

150-160 bright stock, solvent refined, 0-10 pp., 95 v.i.	23.0
200 vis. neutral oil, solvent refined, 0-10 pp., 95 v.i.	20.5

Pennsylvania Grade:

145-155 vis. at 210, bright stock, 8 color, 25 p.t.	22
200 vis. neutral (180° at 100°), 25 p.t.	21

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$1.86	....	....	....	....
15-15.9	1.95	....	....	....	$1.81
16-16.9	2.04	....	....	....	1.86
17-17.9	2.13	....	....	....	1.91
18-18.9	2.23	....	....	....	1.96
19-19.9	2.32	....	....	....	2.01
20-20.9	2.41	$2.75	....	$2.62	2.06
21-21.9	2.50	2.77	....	2.64	2.11
22-22.9	2.60	2.79	....	2.66	2.16
23-23.9	2.69	2.81	$3.44	2.68	2.21
24-24.9	2.78	2.83	3.46	2.70	2.26
25-25.9	2.87	2.85	3.48	2.72	2.31
26-26.9	2.96	2.87	3.50	2.74	2.36
27-27.9	3.06	2.89	3.52	2.76	2.49
28-28.9	3.11	2.91	3.54	2.78	2.54
29-29.9	3.16	2.93	3.56	2.80	2.59
30-30.9	3.22	2.95	....	2.82	2.63
31-31.9	3.27	2.97	....	2.84	2.67
32-32.9	3.33	2.99	....	2.86	2.71
33-33.9	3.38	3.01	....	2.88	2.75
34-34.9	3.44	3.03	....	2.90	2.79
35-35.9	3.49	3.05	....	2.92	2.83
36-36.9	3.55	3.07	....	2.94	2.87
37-37.9	3.60	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40-44.9	....	3.15	....	3.02	2.95

*Includes Oklahoma (sweet), part of Kansas, North Dakota, West Texas (sweet). Some Oklahoma selling 14-31 cents under this schedule. †Low cold test crude. ‡Sour.

Effective dates of broad changes: California, 9-30-58; East of California, January 3-10, 1957; Pennsylvania Grade, 6-18-58.

FLAT PRICES

Louisiana:

Sweet Lake	$3.00
Ville Platte	3.30

Texas:

East Texas	3.25
Conroe	3.53
Van	3.08

Pennsylvania Grade:

Bradford	3.90
Middle District	3.72
Southwest Pennsylvania	3.43
West Virginia	3.25
Buckeye Grade	3.25

Illinois Basin 3.00

Canada:

Leduc-Woodbend	2.67
Redwater (Alta.)	2.56
Smiley (Sask.)	2.33
Pembina	2.52

FOREIGN

Venezuela:

Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26°-26.9°, Amuay*	2.55
Quiriquire, 16.0°-16.4°, Caripito	2.15
Lagunillas heavy, flat, Amuay or Las Piedras*	2.10
Bachequero, flat, 15°-16°, Las Piedras*	1.93

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):

Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Ababan	1.99
Iraq, 35.0°-35.9°, Fao	1.98
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0°-41.9°, Umm Said	2.23

Middle East, E. Mediterranean:

Arabian, 36.0°-36.9°, Sidon	2.49
Iraq, 36.0°-36.9°, Tripoli, Banias	2.49

Far East (cargoes, f.o.b. Lutong, Sarawak):

Seria Light, 37°	2.75

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Carib.-U.S.N.H., dirty (USMC—50%)	$1.35
★ Carib.-U.K., dirty (Scale—47½%) (17s. 1d.)	2.39
★ P.G.-U.S.N.H., dirty (USMC—55%)	5.72
P.G.-U.K., dirty (Scale—50%) (30s. 2d.)	4.23

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FOR SALE EQUIPMENT

FOR SALE—1949 Franks 5000DC-SD Servicing Unit on International KB-8 Tandem less Mast. Inquire P. O. Box 203, Sand Springs, Oklahoma. Telephone CIrcle 5-5240.

FOR SALE OR TRADE—Radoil Exploration Equipment. Good condition. Ready to be mounted on vehicles manufactured by Engineering Research Corporation at original cost of $20,000.00. Will consider any offer to buy or trade. Box K-904, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: Two (2) 350 KW Caterpillar D-397 turbo charged diesel generating units, 240-480 V.—3 ph.—60 cy., complete with distribution panel and control panel for parallel operation. Engines purchased new July 1957, and have run only 4000 hours each. Units replaced by commercial power line. For further information contact Guy C. Swain, Purchasing Agent, KERMAC NUCLEAR FUELS CORP. Box 218, Grants, New Mexico. Box K-888, The Oil and Gas Journal, Tulsa, Oklahoma.

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MILL PRICE—LESS 10%

3,600 ft. 7" 23#, LT&C, N-80, R-3
800 ft. 7" 26#, LT&C, N-80, R-3
3,700 ft. 7" 28#, LT&C, N-80, R-3
600 ft. 7" 32#, LT&C, N-80, R-3
9,000 ft. 2⅞" 6.5#, T&C, N-80, R-2

All API Youngstown seamless, in perfect condition.

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3—Horizontal stainless steel tanks 9' dia. x 24', ¼" shell, ⅜", dished heads, used for beer.
3—Horizontal A. O. Smith Blue Glass welded steel tanks, 9' dia. x 24', ⅜" shell, heads dished heavier, used for beer.
1—Horizontal welded Butane tank 8' x 40', ⅛" shell, heads may be heavier dished.
1—Horizontal welded Butane tank 11'6" dia. x 19', shell ½", heads dished, may be heavier.
1—Horizontal welded steel tank 8' dia. x 40', ¾" shell, 1¼", dished heads.
1—Horizontal Propane welded steel tank 6' dia. x 28', Code U-69, 200# pressure.
1—Horizontal Propane welded steel tank 7' dia. x 43', Code U-69, 200# pressure.
7—Horizontal welded steel tanks 9' dia. x 34'6", 1¾" shell, 1¼" dished heads, Code RU-68 for unfired pressure vessels, 250# pressure, stress relieved, all x-rayed.
Hundreds of other tanks, all sizes, for pressure and ordinary storage up to 120,000 barrels. Also steel buildings, new and used steel pipe, tubing up to 36" diameter.

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CABOT UNIT, Witte engine, 3,000 ft. casing, rods, three lease tanks, like new. Sabetha, Kansas. R. D. Swan, 818 Kennedy Bldg., Tulsa.

WALKER-NEER SPUDDER: 32 special. Light plant, dog house, tools complete. Clean—ready to work. Phone 20 or write Box 788, Drumright, Oklahoma.

C-250, C-150 IDEAL PUMPS, LROU, NKU Waukesha Engines. Complete Ideal No. 50 Rig. Lloyd Darlington, National Supply, Torrance, Calif.

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WAUKESHA ENGINE—195-GKU. Practically new w/"V" belt drive, Ensign carburetor, starter and generator. $750.00. Bellaire Pipe & Supply Co., Inc. 8020 Lyons, OR—4-2763. Houston 29, Texas.

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Wt. 28# to the ft. Lapweld, plain, end beveled for welding, 20' or 40' length No. 1 grade. F.O.B. cars.

Indiana-Ohio Pipe Co.
P. O. Box 323, Decatur, Indiana
Ph.: 3-4674

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Smls., mill tested, app. 40' drl., beveled unused line pipe for sale.
19,000' 20" O.D. x .375", Gr. X-42
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5,600' 16" O.D. x .281", Gr. B
Also smaller amounts of 16", 20" and 24".

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Laurel Pipe Line Company,
402 Dauphin Building, Harrisburg, Pa.

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7" O.D. CASING—New. 23# & 26#, mill tested 3,000#, S.S. R2 & 3, 8rd. thrd. $1.65. Bellaire Pipe & Supply Co., Inc. 8020 Lyons, OR—4-2763, Houston 29, Texas.

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WILSON Double-Drum Mogul Draw-works, Waukesha GK engine. Make offer. Bellaire Pipe & Supply Co., Inc. 8020 Lyons, Houston 29, Tex. OR 4-2763.

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L844-52-42 Cooper Double Drum, Skid Mounted, Front Air Controls, Spudding Equipment; Cathead with Model LDDS Allis Chalmers Engine Complete with Gas-Gasoline Carburetor. *(Used on one well only).*

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Model "E" Allis Chalmers Single Drum Pulling Unit, Tractor Type, Good Rubber, Hydraulic Steering. *Never used since complete overhaul.*
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Tidewater Oil Co.—Drumright, Okla.

Must Vacate Premises Oct. 25

3 Towers 3 'x 42' 40 psi 8 Trays
2'6" x 43 180 psi 24 Trays
2'6" & 4' x 77 275 psi 32 trays
2 Petrochem Heaters, 19 & 25 Million BTU
1 Peabody Air Heater 10,000 SCFM Air from 100° to 1200°
1 Air Blower 11,800 CFM 11 psi, 600 HP.
2 Heat Exchangers 880 & 1042 sq. ft.
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1 Passenger Elevator 182 ft.
4 Cent. Pumps, 3000 GPM 200 HP (2) 1500 GPM 125 HP—680 GPM 40 HP.
5 Steam Pumps 8 x 4 x 6
4½ x 4 x 6 — 8 x 4½ x 12
New Croloy 9 Tubing 2⅞ OD—3300 ft.
New Tubes for Petrochem Furnaces
Croloy 5 Pipe 200 ft. 20"—1100 ft. 8" 250 ft. 6"
CAT D6 Tractor 74" GA, 16" Shoes
8500 Gal. Ethyl Blending Plant
100 Station Automatic Telephone Eqpt.
200 Ton Used BC Socony Catalyst
2700# Du Pont Antioxident
1000# Dyes Asstd. Colors

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310 Thompson Bldg., Tulsa 3, Oklahoma, Diamond 3-4890
SITE OFFICE—Drumright, Okla., Phone 569

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USED ROTARY DRILLING EQUIPMENT. Rigs, drill pipe, drill collars and accessory equipment. Inquiries appreciated. Harries Sales & Rentals, P. O. Box 1568, Odessa, Texas.

SACRIFICE SALE: Three seismograph drills; two Mayhew 1000 Combinations and one Franks Combination. Also three water trucks and three pickups; drill pipe, subs, tools. Contact H. S. Smith, Box 845, Seminole, Texas; phone PLaza 8-2232.

GAS COMPRESSOR. Worthington 5¼" x 13", Single Stage, 6 WAKU Engine, complete installation, A-1 Condition. Skid-mounted, located at Ashland, Kansas. A good buy! Write P. O. Box 1198, Wichita 1, Kansas, or phone AMherst 7-6201.

CARDWELL PORTABLE ROTARY RIGS COMPLETE

1500 to 6000 ft. with 4½" drill pipe or deeper with 3½". Terms or lease purchase.

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FOR SALE

The following complete rotary drilling rigs:

One U-15 powered by 2 NKU Waukesha engines

Two U-15 powered by 3 KKU Waukesha engines

One U-15 powered by 2 LRO Waukesha engines

For further information or inspection of the rigs contact:

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ORchard 3-3071

Another Large Auction

MACHINE TOOLS, WELDING EQUIPMENT, SHOP EQUIPMENT, OFFICE EQUIPMENT

EMPIRE MACHINERY COMPANY

1008 E. Second St. — **Odessa, Texas**
10:00 A. M. (CST) — **Inspection Begins**
Monday, Nov. 3, 1958 — **Oct. 23, Until Sale**

Empire Machinery Co., Odessa, Texas, is going out of business and has commissioned Wayne Cook Associates, Inc. to sell all of their machine tools and other equipment at public auction. Some excellent heavy equipment will be offered and every piece must be sold.

EVERYTHING SELLS—NO MINIMUM—NO RESERVATION

MACHINERY incls. Warner-Swasey, American, Lodge & Shipley and South Bend Lathes; Vertical Boring Mill; Milling Machine; Shaper; Radial Drill; Smalley General Thread Miller, Drill Presses, Gauges and Gauge Sets, Hand Tools, and many other items.

A large amount of welding equipment, elec. drills, saws, presses, benches, bench and pedestal grinders, hoists, vises, etc.

Also shop equip. incl. valve seat grinders, testing equip., etc.

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UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Washington 25, D. C. Notice is hereby given that approximately 159.21 acres of land in three parcels within the known geologic structure of the Monroe gas field, Louisiana, will be offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 1:00 p.m., E.S.T., November 5, 1958, when bids will be opened. Full details of the lease offering, and how and where to submit bids, may be obtained from the Manager, Eastern States Land Office, Bureau of Land Management, Washington 25, D. C. H. K. Scholl, Manager.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that 160 acres of land in one parcel within the known geologic structure of the Fiddler Creek field, Wyoming, will be offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 2:00 P.M., MST, December 2, 1958, when bids will be opened. Full details of the lease offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Craig A. Decker, Manager.

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World briefs

A second test of a 370,000-acre concession in southeastern Turkey will be spudded soon by Bolsa Chica Oil Corp. The new wildcat, 1 Hazro, will be located 17 miles east of the 1 Zengilan, which was abandoned at 6,449 ft. as a dry hole. This activity is about 50 miles north of Diyarbakir.

Pakistan may next grant concessions to the Italian oil agency, ENI, and to a Japanese group. Reports from Karachi indicate these companies are offering better terms than existing contracts. The government also wants to stir up more exploration work by British and American companies which already hold rights.

A Bahama concession covering 300,000 acres of islands and offshore areas has been awarded to Siebens Leaseholds, Ltd., a Canadian firm. The rights cover the southeast portion of the island group, including San Salvador.

Egypt is discussing a possible 32,500-bbl. refinery with West German firms, and a 20,000-bbl. distillation plant with the Russians. The units would be financed with credits Egypt has already acquired from the two countries.

Three French financial groups have each taken 8% interest in the 1,800-sq.-mile Algerian concession held by Ste. des Petroles de Valence, half owned by British Petroleum Co., Ltd. The firms are FRANCAREP, COPAREX, and EURAFREP.

Frobisher, Ltd., a Canadian company, has entered exploration play in East Africa. It has acquired rights over 70,000 sq. miles in Somalia, and 7,000 sq. miles over an adjoining area of Kenya.

The first Swiss wildcat drilled in several years has been abandoned. A West German firm, Gewerkschaft Elwerath, took the test to 5,000 ft. at Chapelie sur Moudon, Switzerland. The concession holder is S.A. des Hydrocarbures.

LEGAL

SEALED BIDS will be received until 2:00 P.M. Mountain Standard Time, October 28, 1958, and opened at that time in the Office of the Uintah and Ouray Indian Agency, Fort Duchesne, Utah, for the leasing of 33,874.53 acres of Tribal land and 1,020.6 acres of allotted Indian land, located in Townships 2 and 3 South, Ranges 3, 4, 5 and 6 West, Duchesne County, Utah, for oil and gas mining purposes. The details of the lease offering and how and where to file bids may be obtained by addressing the inquiry to the Superintendent of the Uintah and Ouray Indian Agency, at Fort Duchesne, Utah.

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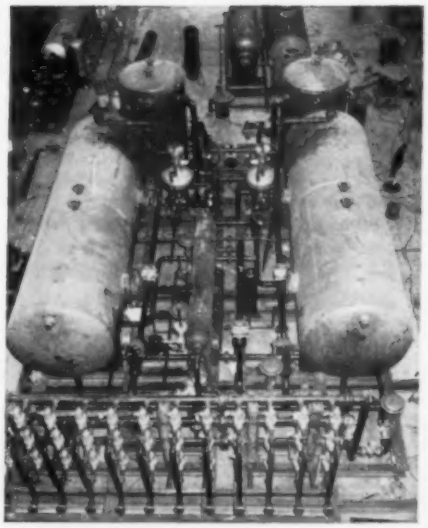

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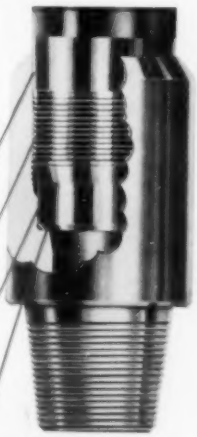
- Inside Cylindrical Seal
- Shoulder Seal



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